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(54) Title: NUCLEIC ACIDS, PROTEINS, AND ANTIBODIES

(57) Abstract: The present invention relates to novel proteins. More specifically, isolated nucleic acid molecules are provided encoding novel polypeptides. Novel polypeptides and antibodies that bind to these polypeptides are provided. Also provided are vectors, host cells, and recombinant and synthetic methods for producing human polynucleotides and/or polypeptides, and antibodies. The invention further relates to diagnostic and therapeutic methods useful for diagnosing, treating, preventing and/or prognosing disorders related to these novel polypeptides. The invention further relates to screening methods for identifying agonists and antagonists of polynucleotides and polypeptides of the invention. The present invention further relates to methods and/or compositions for inhibiting or enhancing the production and function of the polypeptides of the present invention.



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Nucleic Acids, Proteins, and Antibodies

[1] This application refers to a "Sequence Listing" that is provided only on electronic media in computer readable form pursuant to Administrative Instructions Section 801(a)(i). The Sequence Listing forms a part of this description pursuant to Rule 5.2 and Administrative Instructions Sections 801 to 806, and is hereby incorporated in its entirety.

[2] The Sequence Listing is provided as an electronic file (PTZ15PCT_seqList.txt, 1,891,228 bytes in size, created on January 13, 2001) on four identical compact discs (CD-R), labeled "COPY 1," "COPY 2," "COPY 3," and "CRF." The Sequence Listing complies with Annex C of the Administrative Instructions, and may be viewed, for example, on an IBM-PC machine running the MS-Windows operating system by using the V viewer software, version 2000 (see World Wide Web URL: <http://www.fileviewer.com>).

Field of the Invention

[3] The present invention relates to novel proteins. More specifically, isolated nucleic acid molecules are provided encoding novel polypeptides. Novel polypeptides and antibodies that bind to these polypeptides are provided. Also provided are vectors, host cells, and recombinant and synthetic methods for producing human polynucleotides and/or polypeptides, and antibodies. The invention further relates to diagnostic and therapeutic

methods useful for diagnosing, treating, preventing and/or prognosing disorders related to these novel polypeptides. The invention further relates to screening methods for identifying agonists and antagonists of polynucleotides and polypeptides of the invention. The present invention further relates to methods and/or compositions for inhibiting or enhancing the production and function of the polypeptides of the present invention.

Background of the Invention

[4] The Human genome is estimated to contain roughly 100,000 genes, each of which plays an important function in sustaining life. Each of these roughly 100,000 genes encodes for a corresponding protein which can be classified based upon its structure and/or function. Some proteins are secreted, while other proteins reside either as membrane associated proteins or intracellularly. Although protein sequences vary substantially, many patterns and overall properties are shared, such as, for example, amino-terminal signal sequences.

[5] Some proteins, for example secreted proteins, contain an amino-terminal signal sequence which facilitates protein transport. This amino-terminal signal sequence directs, or targets, the protein from its ribosomal assembly site to a particular cellular or extracellular location. Transport may involve any combination of several of the following steps: contact with a chaperone, unfolding, interaction with a receptor and/or a pore complex, addition of energy, and refolding. Moreover, an extracellular protein may be produced as an inactive precursor. Once the precursor has been exported, removal of the signal sequence by a signal peptidase activates the protein. Examples of some protein families that contain signal sequences include cytokines (chemokines) and hormones (growth and differentiation factors). Computer algorithms can be generated to identify amino-terminal signal sequences. Examples of computer programs designed to identify amino-terminal signal sequences include hidden Markov models (HMMs), statistical alternatives to FASTA and Smith Waterman algorithms, which have been used to find shared patterns, specifically consensus sequences (Pearson, W.R., and D.J. Lipman, *PNAS*, 85:2444-48 (1988); Smith, T.F., and M.S. Waterman, *J. Mol. Biol.*, 147:195-97 (1981)). These algorithms are quite flexible in that they incorporate information from newly identified sequences to build even more successful patterns.

[6] Other families of proteins exist as membrane associated proteins. Examples of some of these membrane associated protein families include receptors (nuclear, 4

transmembrane, G protein coupled, and tyrosine kinase), protein kinases, phosphatases, neuropeptides and vasomediators, G proteins, ion channels (calcium, chloride, potassium, and sodium), proteases, transporter/pumps (amino acid, sugar, protein, metal and vitamin; calcium, phosphate, potassium, and sodium), matrix molecules (adhesion, cadherin, extracellular matrix molecules, integrin, and selectin), and regulatory proteins. Again, computer programs can aid in the discovery of these molecules. For example, Klein et al. have developed a method ("ALOM", also called as KKD) to detect potential transmembrane segments in polypeptides (Klein, P., et al., *Biochim. Biophys. Acta.*, 815:468 (1985)). It attempts to identify the most probable transmembrane segment from the average hydrophobicity value over a range of amino acid residues. It predicts whether the segment is a transmembrane segment (INTEGRAL) or not (PERIPHERAL), and thus can suggest membrane association of a polypeptide.

[7] Furthermore, some proteins function intracellularly, and can be identified by their structure and/or function. Computer algorithms can be adapted to aid in the identification of novel members of intracellular protein families. Examples of intracellular proteins include transcription factors, various classes of enzymes, Mitochondrial proteins, and signal transduction molecules.

[8] Descriptions of some of these proteins (e.g., receptors, hormones, and matrix proteins) and diseases associated with their dysfunction follow.

Summary of the Invention

[9] The present invention relates to novel proteins. More specifically, isolated nucleic acid molecules are provided encoding novel polypeptides. Novel polypeptides and antibodies that bind to these polypeptides are provided. Also provided are vectors, host cells, and recombinant and synthetic methods for producing human polynucleotides and/or polypeptides, and antibodies. The invention further relates to diagnostic and therapeutic methods useful for diagnosing, treating, preventing and/or prognosing disorders related to these novel polypeptides. The invention further relates to screening methods for identifying agonists and antagonists of polynucleotides and polypeptides of the invention. The present invention further relates to methods and/or compositions for inhibiting or enhancing the production and function of the polypeptides of the present invention.

Detailed Description

Tables

[10] Table 1A summarizes some of the polynucleotides encompassed by the invention (including cDNA clones related to the sequences (Clone ID NO:Z), contig sequences (contig identifier (Contig ID:)) and contig nucleotide sequence identifier (SEQ ID NO:X)) and further summarizes certain characteristics of these polynucleotides and the polypeptides encoded thereby. The first column provides the gene number in the application for each clone identifier. The second column provides a unique clone identifier, "Clone ID NO:Z", for a cDNA clone related to each contig sequence disclosed in Table 1A. The third column provides a unique contig identifier, "Contig ID:" for each of the contig sequences disclosed in Table 1A. The fourth column provides the sequence identifier, "SEQ ID NO:X", for each of the contig sequences disclosed in Table 1A. The fifth column, "ORF (From-To)", provides the location (i.e., nucleotide position numbers) within the polynucleotide sequence of SEQ ID NO:X that delineate the preferred open reading frame (ORF) that encodes the amino acid sequence shown in the sequence listing and referenced in Table 1A as SEQ ID NO:Y (column 6). Column 7 lists residues comprising predicted epitopes contained in the polypeptides encoded by each of the preferred ORFs (SEQ ID NO:Y). Identification of potential immunogenic regions was performed according to the method of Jameson and Wolf (CABIOS, 4; 181-186 (1988)); specifically, the Genetics Computer Group (GCG) implementation of this algorithm, embodied in the program PEPTIDESTRUCTURE (Wisconsin Package v10.0, Genetics Computer Group (GCG), Madison, Wisc.). This method returns a measure of the probability that a given residue is found on the surface of the protein. Regions where the antigenic index score is greater than 0.9 over at least 6 amino acids are indicated in Table 1A as "Predicted Epitopes". In particular embodiments, polypeptides of the invention comprise, or alternatively consist of, one, two, three, four, five or more of the predicted epitopes described in Table 1A. It will be appreciated that depending on the analytical criteria used to predict antigenic determinants, the exact address of the determinant may vary slightly. Column 8, "Tissue Distribution" shows the expression profile of tissue, cells, and/or cell line libraries which express the polynucleotides of the invention. The first number in column 8 (preceding the colon), represents the tissue/cell source identifier code corresponding to the key provided in Table 4. Expression of these polynucleotides was not observed in the other tissues and/or cell libraries tested. For those identifier codes in which

the first two letters are not “AR”, the second number in column 8 (following the colon), represents the number of times a sequence corresponding to the reference polynucleotide sequence (e.g., SEQ ID NO:X) was identified in the tissue/cell source. Those tissue/cell source identifier codes in which the first two letters are “AR” designate information generated using DNA array technology. Utilizing this technology, cDNAs were amplified by PCR and then transferred, in duplicate, onto the array. Gene expression was assayed through hybridization of first strand cDNA probes to the DNA array. cDNA probes were generated from total RNA extracted from a variety of different tissues and cell lines. Probe synthesis was performed in the presence of ^{33}P dCTP, using oligo(dT) to prime reverse transcription. After hybridization, high stringency washing conditions were employed to remove non-specific hybrids from the array. The remaining signal, emanating from each gene target, was measured using a Phosphorimager. Gene expression was reported as Phosphor Stimulating Luminescence (PSL) which reflects the level of phosphor signal generated from the probe hybridized to each of the gene targets represented on the array. A local background signal subtraction was performed before the total signal generated from each array was used to normalize gene expression between the different hybridizations. The value presented after “[array code]:” represents the mean of the duplicate values, following background subtraction and probe normalization. One of skill in the art could routinely use this information to identify normal and/or diseased tissue(s) which show a predominant expression pattern of the corresponding polynucleotide of the invention or to identify polynucleotides which show predominant and/or specific tissue and/or cell expression. Column 9 provides the chromosomal location of polynucleotides corresponding to SEQ ID NO:X. Chromosomal location was determined by finding exact matches to EST and cDNA sequences contained in the NCBI (National Center for Biotechnology Information) UniGene database. Given a presumptive chromosomal location, disease locus association was determined by comparison with the Morbid Map, derived from Online Mendelian Inheritance in Man (Online Mendelian Inheritance in Man, OMIMTM. McKusick-Nathans Institute for Genetic Medicine, Johns Hopkins University (Baltimore, MD) and National Center for Biotechnology Information, National Library of Medicine (Bethesda, MD) 2000. World Wide Web URL: <http://www.ncbi.nlm.nih.gov/omim/>). If the putative chromosomal location of the Query overlaps with the chromosomal location of a Morbid Map entry, an OMIM identification number is disclosed in column 10 labeled “OMIM Disease Reference(s)”. A key to the OMIM reference identification numbers is provided in Table 5.

[11] Table 1B summarizes additional polynucleotides encompassed by the invention (including cDNA clones related to the sequences (Clone ID NO:Z), contig sequences (contig identifier (Contig ID:) contig nucleotide sequence identifiers (SEQ ID NO:X)), and genomic sequences (SEQ ID NO:B). The first column provides a unique clone identifier, "Clone ID NO:Z", for a cDNA clone related to each contig sequence. The second column provides the sequence identifier, "SEQ ID NO:X", for each contig sequence. The third column provides a unique contig identifier, "Contig ID:" for each contig sequence. The fourth column, provides a BAC identifier "BAC ID NO:A" for the BAC clone referenced in the corresponding row of the table. The fifth column provides the nucleotide sequence identifier, "SEQ ID NO:B" for a fragment of the BAC clone identified in column four of the corresponding row of the table. The sixth column, "Exon From-To", provides the location (i.e., nucleotide position numbers) within the polynucleotide sequence of SEQ ID NO:B which delineate certain polynucleotides of the invention that are also exemplary members of polynucleotide sequences that encode polypeptides of the invention (e.g., polypeptides containing amino acid sequences encoded by the polynucleotide sequences delineated in column six, and fragments and variants thereof).

[12] Table 2 summarizes homology and features of some of the polypeptides of the invention. The first column provides a unique clone identifier, "Clone ID NO:Z", corresponding to a cDNA clone disclosed in Table 1A. The second column provides the unique contig identifier, "Contig ID:" corresponding to contigs in Table 1A and allowing for correlation with the information in Table 1A. The third column provides the sequence identifier, "SEQ ID NO:X", for the contig polynucleotide sequence. The fourth column provides the analysis method by which the homology/identity disclosed in the Table was determined. Comparisons were made between polypeptides encoded by the polynucleotides of the invention and either a non-redundant protein database (herein referred to as "NR"), or a database of protein families (herein referred to as "PFAM") as further described below. The fifth column provides a description of the PFAM/NR hit having a significant match to a polypeptide of the invention. Column six provides the accession number of the PFAM/NR hit disclosed in the fifth column. Column seven, "Score/Percent Identity", provides a quality score or the percent identity, of the hit disclosed in columns five and six. Columns 8 and 9, "NT From" and "NT To" respectively, delineate the polynucleotides in "SEQ ID NO:X" that encode a polypeptide having a significant match to the PFAM/NR database as disclosed in the fifth and sixth columns. In specific embodiments polypeptides of the invention comprise,

or alternatively consist of, an amino acid sequence encoded by a polynucleotide in SEQ ID NO:X as delineated in columns 8 and 9, or fragments or variants thereof.

[13] Table 3 provides polynucleotide sequences that may be disclaimed according to certain embodiments of the invention. The first column provides a unique clone identifier, "Clone ID", for a cDNA clone related to contig sequences disclosed in Table 1A. The second column provides the sequence identifier, "SEQ ID NO:X", for contig sequences disclosed in Table 1A. The third column provides the unique contig identifier, "Contig ID:", for contigs disclosed in Table 1A. The fourth column provides a unique integer 'a' where 'a' is any integer between 1 and the final nucleotide minus 15 of SEQ ID NO:X, and the fifth column provides a unique integer 'b' where 'b' is any integer between 15 and the final nucleotide of SEQ ID NO:X, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:X, and where b is greater than or equal to a + 14. For each of the polynucleotides shown as SEQ ID NO:X, the uniquely defined integers can be substituted into the general formula of a-b, and used to describe polynucleotides which may be preferably excluded from the invention. In certain embodiments, preferably excluded from the invention are at least one, two, three, four, five, ten, or more of the polynucleotide sequence(s) having the accession number(s) disclosed in the sixth column of this Table (including for example, published sequence in connection with a particular BAC clone). In further embodiments, preferably excluded from the invention are the specific polynucleotide sequence(s) contained in the clones corresponding to at least one, two, three, four, five, ten, or more of the available material having the accession numbers identified in the sixth column of this Table (including for example, the actual sequence contained in an identified BAC clone).

[14] Table 4 provides a key to the tissue/cell source identifier code disclosed in Table 1A, column 8. Column 1 provides the tissue/cell source identifier code disclosed in Table 1A, Column 8. Columns 2-5 provide a description of the tissue or cell source. Codes corresponding to diseased tissues are indicated in column 6 with the word "disease". The use of the word "disease" in column 6 is non-limiting. The tissue or cell source may be specific (e.g. a neoplasm), or may be disease-associated (e.g., a tissue sample from a normal portion of a diseased organ). Furthermore, tissues and/or cells lacking the "disease" designation may still be derived from sources directly or indirectly involved in a disease state or disorder, and therefore may have a further utility in that disease state or disorder. In numerous cases where the tissue/cell source is a library, column 7 identifies the vector used to generate the library.

[15] Table 5 provides a key to the OMIM reference identification numbers disclosed in Table 1A, column 10. OMIM reference identification numbers (Column 1) were derived from Online Mendelian Inheritance in Man (Online Mendelian Inheritance in Man, OMIM. McKusick-Nathans Institute for Genetic Medicine, Johns Hopkins University (Baltimore, MD) and National Center for Biotechnology Information, National Library of Medicine, (Bethesda, MD) 2000. World Wide Web URL: <http://www.ncbi.nlm.nih.gov/omim/>). Column 2 provides diseases associated with the cytologic band disclosed in Table 1A, column 9, as determined using the Morbid Map database.

[16] Table 6 summarizes ATCC Deposits, Deposit dates, and ATCC designation numbers of deposits made with the ATCC in connection with the present application.

[17] Table 7 shows the cDNA libraries sequenced, and ATCC designation numbers and vector information relating to these cDNA libraries.

[18] Table 8 provides a physical characterization of clones encompassed by the invention. The first column provides the unique clone identifier, "Clone ID NO:Z", for certain cDNA clones of the invention, as described in Table 1A. The second column provides the size of the cDNA insert contained in the corresponding cDNA clone.

Definitions

[19] The following definitions are provided to facilitate understanding of certain terms used throughout this specification.

[20] In the present invention, "isolated" refers to material removed from its original environment (e.g., the natural environment if it is naturally occurring), and thus is altered "by the hand of man" from its natural state. For example, an isolated polynucleotide could be part of a vector or a composition of matter, or could be contained within a cell, and still be "isolated" because that vector, composition of matter, or particular cell is not the original environment of the polynucleotide. The term "isolated" does not refer to genomic or cDNA libraries, whole cell total or mRNA preparations, genomic DNA preparations (including those separated by electrophoresis and transferred onto blots), sheared whole cell genomic DNA preparations or other compositions where the art demonstrates no distinguishing features of the polynucleotide/sequences of the present invention.

[21] As used herein, a "polynucleotide" refers to a molecule having a nucleic acid sequence encoding SEQ ID NO:Y or a fragment or variant thereof; a nucleic acid sequence

contained in SEQ ID NO:X (as described in column 3 of Table 1A) or the complement thereof; a cDNA sequence contained in Clone ID NO:Z (as described in column 2 of Table 1A and contained within a library deposited with the ATCC); a nucleotide sequence encoding the polypeptide encoded by a nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B or a fragment or variant thereof; or a nucleotide coding sequence in SEQ ID NO:B as defined in column 6 of Table 1B or the complement thereof. For example, the polynucleotide can contain the nucleotide sequence of the full length cDNA sequence, including the 5' and 3' untranslated sequences, the coding region, as well as fragments, epitopes, domains, and variants of the nucleic acid sequence. Moreover, as used herein, a "polypeptide" refers to a molecule having an amino acid sequence encoded by a polynucleotide of the invention as broadly defined (obviously excluding poly-Phenylalanine or poly-Lysine peptide sequences which result from translation of a polyA tail of a sequence corresponding to a cDNA).

[22] In the present invention, "SEQ ID NO:X" was often generated by overlapping sequences contained in multiple clones (contig analysis). A representative clone containing all or most of the sequence for SEQ ID NO:X is deposited at Human Genome Sciences, Inc. (HGS) in a catalogued and archived library. As shown, for example, in column 2 of Table 1A, each clone is identified by a cDNA Clone ID (identifier generally referred to herein as Clone ID NO:Z). Each Clone ID is unique to an individual clone and the Clone ID is all the information needed to retrieve a given clone from the HGS library. Furthermore, certain clones disclosed in this application have been deposited with the ATCC on October 5, 2000, having the ATCC designation numbers PTA 2574 and PTA 2575; and on January 5, 2001, having the depositor reference numbers TS-1, TS-2, AC-1, and AC-2. In addition to the individual cDNA clone deposits, most of the cDNA libraries from which the clones were derived were deposited at the American Type Culture Collection (hereinafter "ATCC"). Table 7 provides a list of the deposited cDNA libraries. One can use the Clone ID NO:Z to determine the library source by reference to Tables 6 and 7. Table 7 lists the deposited cDNA libraries by name and links each library to an ATCC Deposit. Library names contain four characters, for example, "HTWE." The name of a cDNA clone (Clone ID) isolated from that library begins with the same four characters, for example "HTWEP07". As mentioned below, Table 1A correlates the Clone ID names with SEQ ID NO:X. Thus, starting with an SEQ ID NO:X, one can use Tables 1, 6 and 7 to determine the corresponding Clone ID, which library it came from and which ATCC deposit the library is contained in. Furthermore,

it is possible to retrieve a given cDNA clone from the source library by techniques known in the art and described elsewhere herein. The ATCC is located at 10801 University Boulevard, Manassas, Virginia 20110-2209, USA. The ATCC deposits were made pursuant to the terms of the Budapest Treaty on the international recognition of the deposit of microorganisms for the purposes of patent procedure.

[23] In specific embodiments, the polynucleotides of the invention are at least 15, at least 30, at least 50, at least 100, at least 125, at least 500, or at least 1000 continuous nucleotides but are less than or equal to 300 kb, 200 kb, 100 kb, 50 kb, 15 kb, 10 kb, 7.5kb, 5 kb, 2.5 kb, 2.0 kb, or 1 kb, in length. In a further embodiment, polynucleotides of the invention comprise a portion of the coding sequences, as disclosed herein, but do not comprise all or a portion of any intron. In another embodiment, the polynucleotides comprising coding sequences do not contain coding sequences of a genomic flanking gene (i.e., 5' or 3' to the gene of interest in the genome). In other embodiments, the polynucleotides of the invention do not contain the coding sequence of more than 1000, 500, 250, 100, 50, 25, 20, 15, 10, 5, 4, 3, 2, or 1 genomic flanking gene(s).

[24] A "polynucleotide" of the present invention also includes those polynucleotides capable of hybridizing, under stringent hybridization conditions, to sequences contained in SEQ ID NO:X, or the complement thereof (e.g., the complement of any one, two, three, four, or more of the polynucleotide fragments described herein), the polynucleotide sequence delineated in columns 8 and 9 of Table 2 or the complement thereof, and/or cDNA sequences contained in Clone ID NO:Z (e.g., the complement of any one, two, three, four, or more of the polynucleotide fragments, or the cDNA clone within the pool of cDNA clones deposited with the ATCC, described herein), and/or the polynucleotide sequence delineated in column 6 of Table 1B or the complement thereof. "Stringent hybridization conditions" refers to an overnight incubation at 42 degree C in a solution comprising 50% formamide, 5x SSC (750 mM NaCl, 75 mM trisodium citrate), 50 mM sodium phosphate (pH 7.6), 5x Denhardt's solution, 10% dextran sulfate, and 20 µg/ml denatured, sheared salmon sperm DNA, followed by washing the filters in 0.1x SSC at about 65 degree C.

[25] Also contemplated are nucleic acid molecules that hybridize to the polynucleotides of the present invention at lower stringency hybridization conditions. Changes in the stringency of hybridization and signal detection are primarily accomplished through the manipulation of formamide concentration (lower percentages of formamide result in lowered stringency); salt conditions, or temperature. For example, lower stringency conditions

include an overnight incubation at 37 degree C in a solution comprising 6X SSPE (20X SSPE = 3M NaCl; 0.2M NaH₂PO₄; 0.02M EDTA, pH 7.4), 0.5% SDS, 30% formamide, 100 ug/ml salmon sperm blocking DNA; followed by washes at 50 degree C with 1XSSPE, 0.1% SDS. In addition, to achieve even lower stringency, washes performed following stringent hybridization can be done at higher salt concentrations (e.g. 5X SSC).

[26] Note that variations in the above conditions may be accomplished through the inclusion and/or substitution of alternate blocking reagents used to suppress background in hybridization experiments. Typical blocking reagents include Denhardt's reagent, BLOTTO, heparin, denatured salmon sperm DNA, and commercially available proprietary formulations. The inclusion of specific blocking reagents may require modification of the hybridization conditions described above, due to problems with compatibility.

[27] Of course, a polynucleotide which hybridizes only to polyA⁺ sequences (such as any 3' terminal polyA⁺ tract of a cDNA shown in the sequence listing), or to a complementary stretch of T (or U) residues, would not be included in the definition of "polynucleotide," since such a polynucleotide would hybridize to any nucleic acid molecule containing a poly (A) stretch or the complement thereof (e.g., practically any double-stranded cDNA clone generated using oligo dT as a primer).

[28] The polynucleotide of the present invention can be composed of any polyribonucleotide or polydeoxribonucleotide, which may be unmodified RNA or DNA or modified RNA or DNA. For example, polynucleotides can be composed of single- and double-stranded DNA, DNA that is a mixture of single- and double-stranded regions, single- and double-stranded RNA, and RNA that is mixture of single- and double-stranded regions, hybrid molecules comprising DNA and RNA that may be single-stranded or, more typically, double-stranded or a mixture of single- and double-stranded regions. In addition, the polynucleotide can be composed of triple-stranded regions comprising RNA or DNA or both RNA and DNA. A polynucleotide may also contain one or more modified bases or DNA or RNA backbones modified for stability or for other reasons. "Modified" bases include, for example, tritylated bases and unusual bases such as inosine. A variety of modifications can be made to DNA and RNA; thus, "polynucleotide" embraces chemically, enzymatically, or metabolically modified forms.

[29] The polypeptide of the present invention can be composed of amino acids joined to each other by peptide bonds or modified peptide bonds, i.e., peptide isosteres, and may contain amino acids other than the 20 gene-encoded amino acids. The polypeptides may be

modified by either natural processes, such as posttranslational processing, or by chemical modification techniques which are well known in the art. Such modifications are well described in basic texts and in more detailed monographs, as well as in a voluminous research literature. Modifications can occur anywhere in a polypeptide, including the peptide backbone, the amino acid side-chains and the amino or carboxyl termini. It will be appreciated that the same type of modification may be present in the same or varying degrees at several sites in a given polypeptide. Also, a given polypeptide may contain many types of modifications. Polypeptides may be branched, for example, as a result of ubiquitination, and they may be cyclic, with or without branching. Cyclic, branched, and branched cyclic polypeptides may result from posttranslation natural processes or may be made by synthetic methods. Modifications include acetylation, acylation, ADP-ribosylation, amidation, covalent attachment of flavin, covalent attachment of a heme moiety, covalent attachment of a nucleotide or nucleotide derivative, covalent attachment of a lipid or lipid derivative, covalent attachment of phosphatidylinositol, cross-linking, cyclization, disulfide bond formation, demethylation, formation of covalent cross-links, formation of cysteine, formation of pyroglutamate, formylation, gamma-carboxylation, glycosylation, GPI anchor formation, hydroxylation, iodination, methylation, myristoylation, oxidation, pegylation, proteolytic processing, phosphorylation, prenylation, racemization, selenoylation, sulfation, transfer-RNA mediated addition of amino acids to proteins such as arginylation, and ubiquitination. (See, for instance, *PROTEINS - STRUCTURE AND MOLECULAR PROPERTIES*, 2nd Ed., T. E. Creighton, W. H. Freeman and Company, New York (1993); *POSTTRANSLATIONAL COVALENT MODIFICATION OF PROTEINS*, B. C. Johnson, Ed., Academic Press, New York, pgs. 1-12 (1983); Seifter et al., *Meth. Enzymol.* 182:626-646 (1990); Rattan et al., *Ann. N.Y. Acad. Sci.* 663:48-62 (1992)).

[30] "SEQ ID NO:X" refers to a polynucleotide sequence described, for example, in Tables 1A or 2, while "SEQ ID NO:Y" refers to a polypeptide sequence described in column 6 of Table 1A. SEQ ID NO:X is identified by an integer specified in column 4 of Table 1A. The polypeptide sequence SEQ ID NO:Y is a translated open reading frame (ORF) encoded by polynucleotide SEQ ID NO:X. "Clone ID NO:Z" refers to a cDNA clone described in column 2 of Table 1A.

[31] "A polypeptide having functional activity" refers to a polypeptide capable of displaying one or more known functional activities associated with a full-length (complete) protein. Such functional activities include, but are not limited to, biological activity,

antigenicity [ability to bind (or compete with a polypeptide for binding) to an anti-polypeptide antibody], immunogenicity (ability to generate antibody which binds to a specific polypeptide of the invention), ability to form multimers with polypeptides of the invention, and ability to bind to a receptor or ligand for a polypeptide.

[32] The polypeptides of the invention can be assayed for functional activity (e.g. biological activity) using or routinely modifying assays known in the art, as well as assays described herein. Specifically, one of skill in the art may routinely assay human polypeptides (including fragments and variants) of the invention for activity using assays as described in the examples section below.

[33] "A polypeptide having biological activity" refers to a polypeptide exhibiting activity similar to, but not necessarily identical to, an activity of a polypeptide of the present invention, including mature forms, as measured in a particular biological assay, with or without dose dependency. In the case where dose dependency does exist, it need not be identical to that of the polypeptide, but rather substantially similar to the dose-dependence in a given activity as compared to the polypeptide of the present invention (i.e., the candidate polypeptide will exhibit greater activity or not more than about 25-fold less and, preferably, not more than about tenfold less activity, and most preferably, not more than about three-fold less activity relative to the polypeptide of the present invention).

[34] Table 1A summarizes some of the polynucleotides encompassed by the invention (including contig sequences (SEQ ID NO:X) and clones (Clone ID NO:Z) and further summarizes certain characteristics of these polynucleotides and the polypeptides encoded thereby.

Polynucleotides and Polypeptides of the InventionTABLE 1A

Gene No:	Clone ID NO: Z	Contig ID:	SEQ ID NO: X	ORF (From-To)	AA SEQ ID NO: Y	Predicted Epitopes	Tissue Distribution Library code: count (see Table IV for Library Codes)	Cytologic Band	OMIM Disease Reference(s):
1	HFRBN59	1106393	11	1 - 243	335	Pro-1 to Arg-6, Gln-38 to Ser-44.	AR089: 2, AR061: 1, S0050: 1 and S0260: 1.		
		739539	237	77 - 232	561	Gln-9 to Ser-15.			
2	HE2KJ64	906019	12	2 - 778	336	His-1 to Phe-10, Asp-17 to Phe-22, Pro-25 to Phe-36, Tyr-84 to Trp-90, Pro-95 to Ser-103, Cys-118 to Thr-134.	AR089: 1, AR061: 1, L0362: 3, L0794: 2, H0624: 1, L0471: 1, H0622: 1, H0539: 1, L0439: 1 and L0581: 1.		
3	HAGDV32	1178626	13	247 - 516	337	Pro-1 to Ile-13, Gly-51 to Gln-56, Arg-63 to Thr-68, Ser-75 to Phe-81.	AR061: 3, AR089: 3, L0758: 2, S0010: 1, L0471: 1 and L0439: 1.		
		699372	238	2 - 250	562				
4	HLICC37	856958	14	2 - 346	338	Ala-47 to Ser-62, Glu-70 to Pro-76.	AR061: 13, AR089: 10, L0769: 4, L0717: 3,		

									L0766: 3, L0774: 3, L0775: 3, H0529: 2, L0747: 2, L0756: 2, L0777: 2, H0650: 1, H0663: 1, S0442: 1, S0358: 1, S0278: 1, H0549: 1, H0318: 1, H0052: 1, L0738: 1, H0620: 1, H0014: 1, H0355: 1, H0213: 1, H0606: 1, S0448: 1, S0142: 1, L0770: 1, L0646: 1, L0773: 1, L0651: 1, L0659: 1, L0518: 1, L0663: 1, H0547: 1, H0659: 1, H0539: 1, L0748: 1, L0750: 1, S0260: 1 and H0422: 1.			
5	HBGBU96	1121900	15	3 - 449	339	Ala-61 to Ala-68.	AR089: 1, AR061: 1 H0617: 2, S0031: 2, S0132: 1 and H0181: 1.					
		848220	239	3 - 653	563	Ala-61 to Ala-68.						
6	HAJCQ63	823850	16	1 - 579	340	Pro-101 to Arg-106, Lys-140 to His-145, Pro-158 to Val-163.	AR089: 1, AR061: 1 L0766: 4, H0038: 1, H0616: 1, H0561: 1, L0763: 1, H0521: 1, L0750: 1, L0780: 1.					

7	HLMMV66	1153903	17	621 - 166	341	Arg-14 to Arg-22, Pro-62 to Ala-79, Phe-106 to Arg-114, Glu-120 to Gly-125.	L0758: 1 and L0595: 1. AR061: 7, AR089: 5 H0255: 2, L0493: 2 and L0662: 1.		
		926188	240	218 - 448	564				
8	HLWAR08	1096389	18	1 - 531	342	Tyr-47 to His-53, Lys-87 to Tyr-95, Ser-110 to Ser-116, Thr-124 to Ala-129, Trp-146 to Arg-152.	AR089: 4, AR061: 2 L0539: 1 and H0553: 1.		
		959139	241	3 - 290	565	Tyr-46 to His-52.			
9	HBGTT76	1152327	19	1 - 468	343	Pro-64 to Gly-71, Lys-101 to Trp-106, Glu-108 to Gly-116.	AR089: 46, AR061: 9 H0617: 1		
		903653	242	14 - 556	566	His-8 to Gly-18, Pro-89 to Gly-96, Lys-126 to Trp-131, Glu-133 to Gly-141.			
10	HMCFO24	924647	20	3 - 500	344	Val-30 to Leu-35, Asn-65 to Leu-71, Val-144 to Phe-149.	AR061: 3, AR089: 1 H0457: 5, L0766: 5, H0581: 2, H0090: 2, H0521: 2, L0748: 2, H0171: 1, H0656: 1, S0212: 1, S0140: 1, H0486: 1, H0156: 1, L0471: 1, T0041: 1,		

11	HBIOM94	973137	21	449 - 760	345	Trp-1 to Asp-13.	S0344: 1, S0426: 1, L0387: 1, L0776: 1, L0655: 1, L0367: 1, L0792: 1, L0438: 1, H0690: 1, H0539: 1, H0436: 1, L0439: 1, L0779: 1, L0780: 1, L0755: 1 and H0422: 1. AR089: 10, AR061: 4 L0759: 2 and H0593: 1.			
12	HBJLR11	1012465	22	397 - 2	346		AR089: 8, AR061: 5 H0677: 54, L0604: 11, S0366: 7, L0766: 6, H0445: 6, H0543: 6, H0556: 5, H0650: 5, H0255: 5, L0770: 5, L0655: 5, H0436: 5, L0777: 5, L0485: 5, H0657: 4, H0581: 4, L0769: 4, L0761: 4, L0747: 4, H0656: 3, H0599: 3, H0196: 3, H0373: 3, H0271: 3, L0520: 3, L0546: 3, H0423: 3, H0305: 2, H0333: 2, L0623: 2, H0457: 2, H0100: 2,			

	L0763: 2, S0126: 2, H0660: 2, S0330: 2, H0521: 2, S0044: 2, L0751: 2, L0779: 2, H0542: 2, H0422: 2, H0583: 1, H0341: 1, H0484: 1, H0254: 1, H0306: 1, H0402: 1, S0354: 1, H0580: 1, H0586: 1, H0587: 1, H0559: 1, H0486: 1, H0013: 1, H0002: 1, H0618: 1, H0253: 1, H0318: 1, H0123: 1, H0050: 1, H0024: 1, L0163: 1, H0051: 1, H0416: 1, H0688: 1, S0364: 1, H0616: 1, H0488: 1, H0413: 1, T0041: 1, H0625: 1, H0561: 1, S0144: 1, S0422: 1, H0529: 1, L0762: 1, L0649: 1, L0540: 1, L0783: 1, L0666: 1, S0428: 1, S0053: 1, H0144: 1, H0698: 1, H0701: 1, H0699: 1, H0670: 1,	
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956568	243	2118 - 478	567	Asp-27 to His-32, Gln-65 to Gly-76, Lys-80 to Ser-94, Pro-99 to Asn-104, Gly-126 to Lys-143, Pro-150 to Lys-156, Glu-163 to Glu-175, Val-193 to Asp-204, Met-230 to Ser-263, Ala-278 to Gly-291, Pro-306 to Asn-320, Asn-328 to Lys-333, Glu-348 to Glu-355, Ile-358 to Asn-363, Glu-375 to Ser-381, Lys-390 to Arg-395, Lys-433 to Asn-441, Ser-456 to Phe-463, Glu-484 to Lys-490, Glu-498 to Gly-507, Glu-535 to Glu-547.
975276	244	1024 - 632	568	Arg-1 to Ala-7, Thr-75 to Pro-94, Arg-111 to Gly-118,

13	HLTER04	590990	23	3 - 938	347	Asp-122 to Gln-130. His-1 to Glu-14, Asp-26 to Lys-34, Ser-47 to Lys-52, Asn-97 to Gly-107, Lys-123 to Gln-129, Glu-215 to Asp-228, Pro-245 to Glu-250, Leu-255 to Glu-260, Glu-275 to Gly-306.	AR089: 25, AR061: 15 L0565: 6, H0090: 4, L0439: 4, L0779: 4, L0666: 3, S0360: 2, S0051: 2, H0553: 2, L0766: 2, L0438: 2, S0126: 2, H0521: 2, L0740: 2, L0747: 2, L0749: 2, L0731: 2, L0758: 2, S0192: 2, H0583: 1, S0212: 1, S0442: 1, S0132: 1, H0441: 1, H0431: 1, H0586: 1, H0497: 1, H0069: 1, H0075: 1, S0346: 1, S0474: 1, H0046: 1, H0355: 1, H0267: 1, S0003: 1, H0328: 1, H0615: 1, H0428: 1, T0006: 1, H0163: 1, H0038: 1, H0040: 1, H0623: 1, H0560: 1, H0633: 1, S0344: 1, S0002: 1, S0426: 1, L0770: 1, L0772: 1, L0764: 1, L0776: 1, L0655: 1,		
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									L0659: 1, L0783: 1, L0789: 1, H0144: 1, H0520: 1, H0683: 1, H0670: 1, H0660: 1, S0328: 1, L0748: 1, L0780: 1, L0757: 1, L0599: 1, S0026: 1 and H0543: 1.			
14	HMSMU30	1050601	24	2 - 310	348	Asn-58 to Gly-64.			AR089: 11, AR061: 9 H0050: 2, H0494: 1 and S0426: 1.			
		823859	245	2 - 310	569	Asn-58 to Gly-64.						
15	H2MBY83	752124	25	2 - 493	349	Glu-1 to Lys-27, Thr-77 to Leu-82, Asp-114 to Lys-119, Ser-130 to Thr-138.			AR089: 34, AR061: 16 T0109: 1 and S0310: 1.			
16	HBUAH93	1164739	26	1 - 1344	350	Gly-1 to Glu-12, Glu-22 to Gly-35, Pro-37 to Thr-49, Tyr-72 to Asn-81, Arg-191 to Asp-196, Gly-211 to Thr-218, Ala-256 to Asn-261, Gln-269 to Phe-282, Leu-286 to Arg-293, Phe-393 to Asp-400, Thr-407 to Thr-414.			AR061: 3, AR089: 1 H0547: 2, H0583: 1, S0182: 1, H0327: 1, L0471: 1, H0264: 1, H0539: 1, S0152: 1, H0521: 1 and H0343: 1.			
		810424	246	1 - 489	570	Gly-1 to Glu-12,						

17	HMZAD58	975304	27	293 - 2509	351	Glu-22 to Gly-35, Pro-37 to Thr-49. Ser-40 to Ser-45, His-75 to Trp-81, Ser-113 to Lys-128, Pro-146 to Thr-154, Asp-217 to Val-229, Gly-261 to Gln-270, Glu-313 to Thr-319, Pro-346 to Leu-359, Ala-378 to Ser-385, Ser-388 to Asn-393, Val-407 to Asp-418, Ser-422 to Leu-428, Thr-431 to Leu-441, Leu-478 to Ala-489, Gly-499 to Pro-522, Glu-527 to Tyr-535, Glu-540 to Arg-550, Arg-560 to Arg-593, Arg-625 to Ile-630, Gln-642 to Tyr-649, Lys-669 to Met-675, Ala-687 to Thr-706, Thr-734 to Asn-739.	AR089: 3, AR061: 2 L0749: 7, S0002: 5, L0766: 4, L0771: 3, L0740: 3, H0657: 2, H0266: 2, H0598: 2, H0623: 2, H0521: 2, L0755: 2, S0342: 1, T0049: 1, S0132: 1, H0261: 1, H0438: 1, H0333: 1, H0486: 1, H0013: 1, H0156: 1, H0050: 1, H0591: 1, H0264: 1, L0564: 1, H0560: 1, H0561: 1, L0773: 1, L0521: 1, L0768: 1, L0803: 1, L0774: 1, L0665: 1, H0648: 1, S0032: 1, L0748: 1, L0439: 1, L0747: 1, L0758: 1, S0260: 1, H0665: 1 and H0542: 1.			
18	HCHNH17	975378	28	2 - 1021	352	Pro-78 to Lys-86, Cys-88 to Leu-97, Asp-100 to Ile-107,	AR061: 1, AR089: 0 H0599: 25, L0731: 19, L0750: 14, L0754: 13,	3ql3.3-q21	106165, 117700, 117700,	

Pro-176 to Pro-181, Arg-191 to Met-196, Pro-200 to Arg-210, Pro-246 to Ala-259, Ser-271 to Glu-276, Asp-298 to Trp-306, Pro-332 to Ser-340.	L0766: 8, L0776: 8, L0752: 8, L0757: 8, L0747: 6, L0744: 5, L0769: 4, L0779: 4, L0777: 4, S0420: 3, L0770: 3, L0755: 3, L0758: 3, L0471: 2, L0771: 2, L0775: 2, L0806: 2, L0659: 2, S0126: 2, H0670: 2, L0743: 2, L0759: 2, L0604: 2, H0624: 1, H0685: 1, H0650: 1, H0484: 1, H0483: 1, H0661: 1, S0358: 1, S0360: 1, S0046: 1, H0411: 1, H0632: 1, H0427: 1, S0280: 1, H0097: 1, H0004: 1, S0049: 1, H0028: 1, H0622: 1, L0142: 1, H0591: 1, L0763: 1, L0772: 1, L0800: 1, L0764: 1, L0662: 1, L0768: 1, L0794: 1, L0774: 1, L0807: 1, L0809: 1, L0666: 1, L0665: 1, S0148: 1,	126451, 150210, 169600, 180380, 180380, 180380, 190000, 203500, 232050, 276902, 600882, 601199, 601199, 601199, 601471, 601682
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									S0328: 1, S0406: 1, S3014: 1, S0027: 1, S0028: 1, L0599: 1, S0026: 1 and H0667: 1.			
19	HBWAJ55	802098	29	2 - 64	353	Asn-7 to Asn-12.			AR089: 0, AR061: 0 S0021: 1			
		971772	247	22 - 1299	571	Glu-19 to Asn-42, Ala-135 to Gly-140.						
20	HNJCE31	1152346	30	1266 - 244	354	Ser-21 to Leu-26, Leu-63 to Ser-76, Ala-141 to Pro-153, Pro-184 to Leu-194, Gln-235 to Gly-240, Pro-279 to Asp-288, Lys-296 to Pro-302.			AR061: 1, AR089: 1 L0771: 3, L0766: 3, L0779: 3, H0485: 2, H0424: 2, L0769: 2, L0758: 2, H0657: 1, H0656: 1, H0635: 1, H0634: 1, H0059: 1, S0386: 1, L0763: 1, L0761: 1, L0644: 1, L0768: 1, L0803: 1, S0328: 1, H0539: 1, H0521: 1, H0522: 1, S3012: 1, L0751: 1, L0745: 1, L0752: 1, L0755: 1, L0581: 1 and S0026: 1.			
		911597	248	3 - 1031	572	Gly-9 to Gly-18, Arg-23 to Leu-28, Leu-65 to Ser-78, Ala-143 to Pro-155,						

21	HKA1U14	919538	31	1 - 1347	355	Pro-186 to Leu-196, Gln-237 to Gly-242, Pro-281 to Asp-290, Lys-298 to Pro-304. Glu-14 to Ala-21, Lys-51 to Ser-59, Ile-70 to Phe-75, Ala-107 to Arg-113, Thr-124 to Asn-131, Tyr-171 to Asn-176, Gln-187 to Asn-238, Ser-243 to Ile-248, Glu-265 to Ser-271, Pro-281 to Glu-298, Ser-309 to Met-316, Pro-321 to Pro-329, Gln-374 to Arg-381, Asp-390 to Cys-400.	AR089: 9, AR061: 4 L0766: 7, L0759: 4, L0757: 3, S0354: 2, H0251: 2, L0783: 2, L0439: 2, L0605: 2, H0650: 1, H0657: 1, H0664: 1, S0376: 1, S0360: 1, H0421: 1, H0510: 1, S0250: 1, H0622: 1, H0033: 1, H0169: 1, H0616: 1, H0551: 1, H0494: 1, H0641: 1, L0763: 1, L0772: 1, L0655: 1, S0052: 1, L0438: 1, H0660: 1, S0330: 1, H0521: 1, L0599: 1 and H0542: 1.			
22	HCE4I12	911586	32	1 - 315	356		AR061: 5, AR089: 2 S0222: 5, S0007: 2, H0013: 2, L0471: 2, H0622: 2, H0264: 2, L0803: 2, L0438: 2, L0745: 2, H0542: 2,			

23	HFOYI18	926488	33	12 - 986	357				H0624: 1, H0556: 1, H0411: 1, T0082: 1, S0010: 1, H0052: 1, L2250: 1, H0009: 1, T0010: 1, S6028: 1, S0038: 1, L0641: 1, L0643: 1, L0374: 1, L0662: 1, L0794: 1, L0766: 1, L0804: 1, L0523: 1, L0805: 1, L0655: 1, L0606: 1, L0791: 1, H0547: 1, H0519: 1 and H0689: 1.			
24	HHEDM89	945055	34	1 - 903	358	Glu-1 to Phe-7, Pro-9 to Asn-14.			AR089: 1, AR061: 0 L0794: 3, H0265: 1, T0002: 1, S0116: 1, S0360: 1, H0486: 1, H0581: 1, H0052: 1, H0615: 1, S0036: 1, H0623: 1, L0766: 1, L0803: 1, L0659: 1, L0783: 1, S3014: 1, L0747: 1, L0749: 1, L0777: 1, L0595: 1, H0667: 1, S0276: 1 and H0543: 1.			

							Ser-86 to Ser-92.	L0803: 2, L0754: 2, L0595: 2, H0305: 1, H0589: 1, H0638: 1, H0351: 1, H0486: 1, S0280: 1, L0021: 1, H0318: 1, H0596: 1, S0150: 1, S0144: 1, L0364: 1, L0766: 1, L0809: 1, L0532: 1, H0667: 1 and H0542: 1.		
25	HFXKW18	945288	35	421 - 2337	359	Val-12 to Gln-17, Ala-75 to Arg-82, Lys-112 to Ile-117, Asn-179 to Trp-185, Asp-190 to Lys-209.		AR061: 2, AR089: 1 H0250: 3, S0031: 3, H0271: 2, S0260: 2, S0001: 1, S0282: 1, H0617: 1, L0367: 1, S0053: 1, S0390: 1, L0698: 1 and H0352: 1.		
26	HBIMF04	951601	36	3 - 1229	360			AR089: 3, AR061: 2 L0766: 8, H0457: 7, H0436: 5, L0747: 4, H0486: 3, H0620: 3, H0520: 3, H0341: 2, H0255: 2, H0402: 2, S0358: 2, H0618: 2, H0581: 2, H0024: 2, H0405: 2, H0617: 2, L0761: 2, L0662: 2, L0768: 2, L0803: 2,		

					L0806: 2, L0776: 2, L0809: 2, L0663: 2, H0691: 2, H0555: 2, L0742: 2, L0779: 2, L0731: 2, H0543: 2, H0265: 1, H0584: 1, H0583: 1, H0650: 1, H0657: 1, H0656: 1, H0484: 1, H0125: 1, S0360: 1, H0580: 1, H0549: 1, H0550: 1, H0613: 1, H0600: 1, H0592: 1, H0069: 1, H0253: 1, H0318: 1, L0738: 1, H0544: 1, H0546: 1, H0594: 1, H0266: 1, H0179: 1, H0271: 1, H0622: 1, H0606: 1, H0135: 1, H0040: 1, H0488: 1, S0372: 1, H0646: 1, L0769: 1, L0639: 1, L0772: 1, L0646: 1, L0643: 1, L0645: 1, L0764: 1, L0773: 1, L0775: 1, L0655: 1, L0659: 1, L0790: 1, L0665: 1, H0547: 1,
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									H0593: 1, H0435: 1, S0328: 1, H0522: 1, H0694: 1, H0134: 1, L0741: 1, L0744: 1, L0748: 1, L0758: 1 and H0506: 1.				
27	HEEAU28	912280	37	610 - 449	361	Leu-10 to Pro-28.			AR061: 6, AR089: 3 L0751: 3, L0747: 2, L0361: 2, H0549: 1, H0550: 1, S0280: 1, H0009: 1, H0123: 1, H0620: 1, H0594: 1, H0688: 1, L0800: 1, L0662: 1, L0766: 1, L0803: 1, L0791: 1, L0666: 1, L0663: 1, L0665: 1, H0689: 1, S0390: 1, L0439: 1, L0777: 1 and L0731: 1.				
		946972	249	1 - 441	573	Arg-7 to Tyr-12, Ser-46 to Lys-54, Gln-138 to Ile-147.							
28	HDPKI66	823854	38	2 - 1378	362	Arg-13 to Ser-20, Asn-88 to Lys-94, Met-108 to Glu-113, Ala-154 to Phe-159, Arg-172 to Cys-202.			AR089: 2, AR061: 0 L0748: 11, L0749: 10, L0777: 10, H0521: 9, H0144: 8, L0740: 7, H0013: 5, H0620: 5, H0069: 4, L0754: 4,				

H0266: 3, S0250: 3, S0002: 3, S0027: 3, H0171: 2, H0341: 2, H0580: 2, L0717: 2, H0431: 2, H0156: 2, S0010: 2, S6028: 2, S0003: 2, S0142: 2, S0344: 2, S0426: 2, L0662: 2, L0766: 2, L0803: 2, L0659: 2, S0390: 2, S0037: 2, S3014: 2, L0741: 2, L0743: 2, L0779: 2, L0758: 2, H0444: 2, L0599: 2, H0624: 1, H0170: 1, H0265: 1, H0556: 1, H0657: 1, S0116: 1, S0212: 1, H0663: 1, H0638: 1, S0418: 1, S0356: 1, S0360: 1, H0329: 1, S0007: 1, S0045: 1, S0046: 1, H0619: 1, H0369: 1, S0222: 1, S0280: 1, H0036: 1, H0581: 1, H0251: 1, H0546: 1, H0050: 1, H0109: 1, H0416: 1,
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29	HOCQD08	972981	39	2 - 715	363	Ile-46 to Arg-53, Phe-78 to Pro-86, Leu-112 to Val-119, Ile-125 to Thr-130, Pro-140 to Gly-152, Arg-187 to Glu-199.	S0214: 1, H0428: 1, H0622: 1, H0031: 1, H0111: 1, H0165: 1, L0455: 1, H0090: 1, H0634: 1, H0616: 1, H0551: 1, L0564: 1, H0641: 1, H0646: 1, S0144: 1, S0422: 1, H0695: 1, L0521: 1, L0767: 1, L0804: 1, L0658: 1, L0656: 1, L0790: 1, L0791: 1, L0792: 1, L0438: 1, S0126: 1, H0435: 1, H0648: 1, H0539: 1, H0522: 1, H0631: 1, S0028: 1, L0747: 1, L0731: 1, L0759: 1, L0583: 1, S0011: 1, H0136: 1, S0192: 1, S0276: 1, H0543: 1, H0423: 1 and L0600: 1.	AR089: 3, AR061: 2 H0556: 10, L0748: 8, H0620: 7, L0747: 7, L0637: 5, H0265: 4, H0013: 4, H0551: 4, L0776: 4, L0663: 4,		
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L0596: 4, H0622: 3, H0617: 3, L0772: 3, L0766: 3, S0126: 3, L0751: 3, L0752: 3, S0031: 3, L0593: 3, H0657: 2, S0360: 2, S0222: 2, T0115: 2, H0009: 2, L0471: 2, H0594: 2, H0288: 2, H0039: 2, H0424: 2, H0135: 2, H0040: 2, H0623: 2, L0763: 2, L0769: 2, L0796: 2, L0804: 2, L0775: 2, L0634: 2, L0666: 2, L0438: 2, L0756: 2, L0757: 2, H0445: 2, L0595: 2, H0542: 2, H0423: 2, H0422: 2, T0002: 1, S0114: 1, S0218: 1, H0661: 1, S0358: 1, S0007: 1, S0046: 1, S0132: 1, S0278: 1, H0431: 1, H0370: 1, H0586: 1, H0632: 1, H0486: 1, T0040: 1, S0280: 1, H0318: 1, H0581: 1,								
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						H0085: 1, T0110: 1, H0545: 1, H0081: 1, S0362: 1, H0247: 1, H0266: 1, H0290: 1, H0292: 1, H0286: 1, S0340: 1, S0036: 1, H0090: 1, H0591: 1, H0038: 1, H0616: 1, H0433: 1, H0412: 1, S0038: 1, H0561: 1, S0352: 1, S0144: 1, S0142: 1, L0369: 1, L0761: 1, L0372: 1, L0646: 1, L0374: 1, L0764: 1, L0771: 1, L0773: 1, L0381: 1, L0388: 1, L0774: 1, L0651: 1, L0378: 1, L0657: 1, L0658: 1, L0383: 1, L0665: 1, L0352: 1, H0593: 1, H0689: 1, H0682: 1, H0660: 1, S0328: 1, H0696: 1, S0044: 1, S0037: 1, S3014: 1, S0206: 1, L0439: 1, L0754: 1, L0749: 1, L0750: 1, L0731: 1,				
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30	HDPRP54	1228283	40	48 - 1940	364	Gln-18 to Gly-32, Val-84 to Asn-91, Ala-286 to Leu-292, Lys-412 to Lys-419, Arg-460 to Cys-465, Phe-510 to Leu-515, Leu-567 to Gln-576.	L0759: 1, L0588: 1, L0362: 1, L0361: 1, H0653: 1, H0136: 1, S0196: 1, H0543: 1 and S0424: 1. AR089: 3, AR061: 1 H0486: 3, S0422: 3, L0665: 3, L0527: 2, L0758: 2, L0596: 2, S0358: 1, S0360: 1, S0132: 1, H0586: 1, H0497: 1, H0318: 1, H0046: 1, S0051: 1, H0615: 1, H0032: 1, H0673: 1, S0036: 1, H0038: 1, L0475: 1, L0598: 1, L0637: 1, L0761: 1, L0766: 1, L0774: 1, L0653: 1, L0659: 1, L0666: 1, L0663: 1, L0664: 1, S0328: 1, H0579: 1, H0521: 1, H0696: 1, H0478: 1, S0432: 1, S0390: 1, L0747: 1, L0756: 1, L0779: 1, L0752: 1, H0445: 1, S0026: 1, S0192: 1,		
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		502892	250	48 - 422	574	Gln-18 to Gly-32, Val-84 to Asn-91.	H0543: 1 and H0423: 1.		
31	HE2BW32	609468	41	1 - 228	365		AR089: 28, AR061: 6 H0521: 5, S0222: 2, H0013: 2, H0599: 2, H0622: 2, H0494: 2, S0126: 2, H0624: 1, H0171: 1, S0040: 1, S0420: 1, S0356: 1, S0354: 1, S0360: 1, S0046: 1, H0393: 1, S0622: 1, H0550: 1, H0431: 1, H0586: 1, H0069: 1, H0635: 1, S0280: 1, H0620: 1, H0375: 1, H0594: 1, S0003: 1, S0214: 1, H0591: 1, H0551: 1, H0623: 1, S0144: 1, S0344: 1, S0148: 1, H0547: 1, H0519: 1, H0593: 1, L0602: 1, S0152: 1, S3012: 1, L0740: 1, L0731: 1 and S0194: 1.		
32	HAAU21	670606	42	2 - 364	366		AR089: 2, AR061: 0 L0769: 2, S0420: 1,	16q23	103850

33	HE8DL23	693641	43	29 - 406	367	Leu-68 to Gln-77.	AR089: 1, AR061: 0	H0271: 1, H0561: 1 and H0647: 1.		
34	HFTCM92	928851	44	1 - 378	368	Gly-1 to Arg-7, Ala-9 to Ser-15, Ala-25 to Gly-30, Gln-75 to Cys-84, His-111 to Tyr-116.	AR089: 11, AR061: 7 L0766: 6, H0539: 4, L0769: 3, L0748: 3, L0779: 3, L0731: 3, S0360: 2, H0052: 2, H0545: 2, H0494: 2, L0759: 2, L0599: 2, H0295: 1, L0622: 1, L0021: 1, H0530: 1, H0546: 1, H0457: 1, H0086: 1, H0123: 1, H0687: 1, H0551: 1, H0413: 1, L0646: 1, L0768: 1, L0381: 1, L0659: 1, L0783: 1, L0809: 1, L0790: 1, L0666: 1, L0663: 1, H0520: 1, H0670: 1, S3012: 1, L0747: 1, H0445: 1, S0276: 1, H0543: 1, H0423: 1 and H0352: 1.			
35	HE6BO76	775616	45	2 - 298	369	Gly-10 to Lys-17. Thr-10 to Ala-21.	AR061: 202, AR089:			

						Gln-35 to Trp-45, Gly-54 to Leu-61.	136			
36	HAMFP60	715097	46	2 - 505	370		AR089: 9, AR061: 1 L0766: 3, H0633: 2, H0125: 1, H0050: 1, H0560: 1, S0210: 1, L0783: 1, H0435: 1, S0152: 1 and H0521: 1.			
37	HHFHY84	715098	47	3 - 311	371	Pro-30 to Gly-35.	AR089: 11, AR061: 3 L0766: 3, H0633: 2, H0125: 1, H0050: 1, H0560: 1, S0210: 1, L0783: 1, H0435: 1, S0152: 1 and H0521: 1.			
38	HE6FD03	1150900	48	891 - 232	372	Ser-6 to Glu-16, Asp-33 to Lys-38, Glu-71 to Phe-79, Gln-120 to Glu-131, Met-152 to Asp-159, Ala-169 to Pro-174, Leu-182 to Lys-201.	AR089: 1, AR061: 0 H0046: 1, H0674: 1, H0100: 1, L0774: 1, L0659: 1, L0783: 1, L0438: 1, H0659: 1, L0741: 1, L0747: 1, L0786: 1, L0777: 1 and L0758: 1.			
		859840	252	82 - 762	576	Pro-35 to Ser-43, Glu-61 to Phe-69, Gln-110 to Glu-120.				
39	HDTFT90	1165338	49	396 - 1	373	Gln-12 to Gln-17, Arg-64 to Thr-69, Ser-127 to Ser-132.	AR089: 24, AR061: 7 L0665: 8, L0659: 4, L0809: 4, L0731: 4.			

L0761: 3, L0662: 3,
L0794: 3, L0766: 3,
L0803: 3, L0439: 3,
L0592: 3, S0222: 2,
H0486: 2, H0457: 2,
H0038: 2, L0666: 2,
H0520: 2, H0519: 2,
H0521: 2, L0743: 2,
L0748: 2, L0749: 2,
L0758: 2, L0759: 2,
L0588: 2, L0605: 2,
S0276: 2, S0218: 1,
H0650: 1, S0116: 1,
H0341: 1, H0663: 1,
H0662: 1, H0351: 1,
H0592: 1, L0623: 1,
H0013: 1, L0021: 1,
H0014: 1, H0553: 1,
H0644: 1, H0551: 1,
H0412: 1, H0100: 1,
L0475: 1, H0130: 1,
L0640: 1, L0763: 1,
L0769: 1, L0638: 1,
L0637: 1, L0646: 1,
L0554: 1, L0806: 1,
L0805: 1, L0653: 1,
L0776: 1, L0655: 1,
L0787: 1, L0789: 1,

40	HPJCU63	944518	253	25 - 294	577	Thr-27 to Leu-32, Gly-42 to Gly-56, Ser-80 to Arg-90.	L0663: 1, L0438: 1, H0593: 1, H0682: 1, H0659: 1, H0670: 1, H0672: 1, S0404: 1, L0744: 1, L0750: 1, L0777: 1, H0445: 1, S0434: 1, L0366: 1, H0543: 1 and H0422: 1.		
		1082458	50	898 - 461	374	Phe-14 to Pro-20, His-23 to Ile-30, Ala-53 to Thr-58.	AR089: 3, AR061: 2 L0163: 1, L0806: 1, L0788: 1, H0144: 1, S0152: 1 and L0361: 1.		
		904598	254	3 - 848	578	Thr-108 to Gly-115, Val-174 to Gly-181, Ala-205 to Gly-214, Pro-272 to Asn-282.			
41	HFITE38	793203	51	2 - 409	375	Pro-1 to Glu-13, Ser-22 to Lys-28, Gln-39 to Arg-50, Ser-111 to Asp-116.	AR089: 23, AR061: 3 S0196: 4, H0032: 1 and L0769: 1.	Xp11.4- p11.1	300047, 300062, 300600, 309470, 309500, 309610, 310500, 310600, 310600.

									311050, 312060	
42	HDPDH64	796509	52	1 - 303	376	Pro-5 to Lys-22, Arg-43 to Glu-51, Arg-63 to Ala-71, Asp-73 to Lys-79.	AR089: 3, AR061: 1 H0521: 6, H0580: 1, H0012: 1, L0800: 1, H0522: 1 and L0595: 1.			
43	HFKKS58	1158800	53	2 - 1135	377		AR089: 1, AR061: 1 H0638: 2, L0665: 2, L0747: 2, L0759: 2, H0170: 1, H0686: 1, H0671: 1, H0587: 1, L0622: 1, L0471: 1, H0620: 1, S0250: 1, T0006: 1, H0553: 1, H0673: 1, H0169: 1, H0551: 1, T0067: 1, H0413: 1, H0560: 1, H0538: 1, L0598: 1, L0520: 1, L0764: 1, L0766: 1, L0649: 1, L0375: 1, L0666: 1, L0663: 1, L0664: 1, H0144: 1, H0693: 1, H0659: 1, S0027: 1, L0749: 1, L0756: 1, L0777: 1, L0594: 1, S0276: 1, H0422: 1 and H0352: 1.			

44	HE8CM38	1197903	54	2 - 616	378	Gln-93 to Gln-100, Thr-206 to Arg-212, Gln-260 to Leu-269, Arg-277 to Asp-284, Arg-350 to Lys-357, Arg-363 to Lys-378. His-44 to Gly-49, His-148 to Gly-154, Lys-181 to Phe-204.	AR089: 14, AR061: 9 L0803: 6, L0742: 5, S0222: 4, H0599: 4, H0620: 4, L0766: 4, L0748: 4, L0439: 4, L0809: 3, H0555: 3, L0749: 3, S0282: 2, S0354: 2, H0431: 2, H0574: 2, T0039: 2, L0435: 2, L0666: 2, L0665: 2, L0438: 2, L0756: 2, L0753: 2, S0031: 2, L0588: 2, S0356: 1, S0358: 1, S0360: 1, H0393: 1, S6016: 1, H0592: 1, H0643: 1, H0331: 1, H0013: 1, H0156: 1, H0575: 1, H0590: 1, S0010: 1, H0581: 1, S0049: 1, H0327: 1, H0012: 1, H0024: 1,		
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45	HAIJU67	932013	256	2 - 586	580	His-44 to Gly-49, His-148 to Gly-154.	<p>H0014: 1, L0163: 1, S0388: 1, S0051: 1, S6028: 1, H0622: 1, H0032: 1, H0163: 1, H0038: 1, H0413: 1, H0059: 1, L0520: 1, L0770: 1, L0761: 1, L0772: 1, L0643: 1, L0764: 1, L0662: 1, L0767: 1, L0804: 1, L0775: 1, L0805: 1, L0657: 1, L0659: 1, L0790: 1, L0663: 1, L0352: 1, H0547: 1, H0689: 1, H0648: 1, L0751: 1, L0779: 1, L0777: 1, L0758: 1 and L0759: 1.</p>		
		856922	55	340 - 729	379	Pro-1 to Arg-8.	<p>AR061: 1, AR089: 1 H0585: 9, H0265: 2, H0141: 2, S0360: 2, H0251: 2, H0031: 2, L0519: 2, L0545: 2, L0664: 2, H0668: 2, S0040: 1, T0049: 1, H0656: 1, H0255: 1,</p>		

46	HHEHD10	1204696	56	481 - 1458	380	Thr-16 to Thr-22, Leu-29 to Met-37, Pro-55 to Gln-64, Ser-69 to Leu-75, Pro-82 to Ser-95, Lys-126 to Val-142, Ser-159 to Leu-172, Arg-174 to Met-181, Thr-189 to Asn-195, Arg-216 to Trp-229, Leu-266 to Gly-272, Ala-283 to Glu-289,		S0376: 1, S0132: 1, H0546: 1, H0375: 1, S0314: 1, H0428: 1, H0039: 1, H0553: 1, L0055: 1, H0264: 1, H0561: 1, H0509: 1, L0643: 1, L0803: 1, L0651: 1, L0378: 1, L0776: 1, L0659: 1, L0790: 1, L0666: 1, H0519: 1, S0126: 1, H0521: 1, H0576: 1, L0777: 1, L0755: 1, L0731: 1, L0757: 1, L0759: 1, H0665: 1, S0194: 1 and S0458: 1.		
						AR089: 25, AR061: 8 H0521: 4, L0770: 3, L0761: 3, L0659: 3, H0341: 2, H0617: 2, L0764: 2, L0766: 2, L0666: 2, L0759: 2, L0589: 2, H0265: 1, H0638: 1, S0360: 1, H0369: 1, H0550: 1, S0222: 1, H0586: 1, H0486: 1, H0250: 1, L0021: 1, H0618: 1,				

							Gln-310 to Leu-315.	H0253: 1, H0309: 1, H0271: 1, H0039: 1, H0031: 1, H0087: 1, S0142: 1, L0763: 1, L0372: 1, L0644: 1, L0768: 1, L0375: 1, L0805: 1, L0653: 1, L0776: 1, L0655: 1, L0809: 1, L0663: 1, L0665: 1, H0672: 1, H0555: 1, L0612: 1, L0741: 1, L0740: 1, L0747: 1, L0779: 1, L0777: 1, L0731: 1, L0596: 1, S0276: 1 and H0542: 1.			
47	HHEND45	919630	57	1 - 195	381	3 - 428	581	Pro-3 to Gly-11, Gly-53 to His-63, Leu-70 to Lys-89, Met-99 to Thr-108.	AR089: 4, AR061: 2 H0543: 2		
48	HE8EQ22	1031960	58	169 - 726	382			Leu-39 to Arg-44.	AR089: 7, AR061: 7 H0013: 2, H0560: 2, H0521: 2, H0624: 1, S6028: 1, S0038: 1, T0042: 1, L0475: 1, H0646: 1, S0426: 1,		

								L0766: 1, H0520: 1, H0519: 1, H0555: 1, H0542: 1 and S0424: 1.		
49	HSACD83	911588	59	1 - 402	582	383	Leu-39 to Arg-44, Lys-178 to Asp-186.	AR089: 0, AR061: 0 H0497: 1 and T0039: 1.		
50	HHGBO53	1091714	60	681 - 1	384	384	Glu-20 to Ala-30, Gly-49 to His-62, Ser-75 to Gln-83, Gly-148 to Gly-154, Arg-158 to Ser-167, Pro-169 to Pro-176, Leu-213 to Val-222.	AR089: 9, AR061: 6 H0635: 2, H0333: 1 and H0488: 1.		
51	HE8FD82	1154785	61	2 - 826	385	385	Gln-5 to Gly-10. Arg-12 to Gln-23, Asp-82 to Pro-88, Gly-112 to Ala-120, Arg-122 to Arg-127, Gly-172 to Gly-186, Val-212 to Gly-219, Gly-242 to Gly-247, Thr-253 to Ser-265.	AR061: 4, AR089: 3 L0794: 4, S0360: 2, H0553: 2, H0100: 2, L0803: 2, L0741: 2, L0745: 2, H0686: 1, S0212: 1, S0418: 1, S0420: 1, L0534: 1, T0039: 1, H0013: 1, H0575: 1, H0581: 1, H0327: 1, H0428: 1, T00006: 1, H0032: 1, H0207: 1, S0002: 1,		

52	HOHAS44	909634 914810	260 62	97 - 891 2 - 706	584 386	Ala-29 to Cys-34. Ser-14 to Val-23, Lys-76 to Ser-84, Ser-102 to Leu-109, Gln-119 to Cys-125, Glu-177 to Thr-189, Ala-221 to Phe-231.	L0761: 1, L0499: 1, L0383: 1, L0519: 1, L0543: 1, L0789: 1, L0666: 1, H0144: 1, S0126: 1, H0658: 1, H0670: 1, H0436: 1, L0439: 1, L0786: 1, L0759: 1, L0596: 1 and L0592: 1.		
							AR089: 1, AR061: 0 H0046: 7, H0521: 7, H0052: 6, L0465: 6, H0031: 5, H0624: 4, S0358: 4, H0580: 4, S0010: 4, S0346: 4, H0551: 4, S0212: 3, S0418: 3, S0007: 3, H0437: 3, H0156: 3, H0575: 3, H0457: 3, L0471: 3, T0010: 3, S0250: 3, H0328: 3, H0644: 3, H0040: 3, H0494: 3, S0344: 3, S0002: 3, H0144: 3, L0438: 3, H0520: 3, S0152: 3, H0665: 3, S0001: 2, H0402: 2,		

53	HE8OF42	1117857	63	1 - 513	387	Glu-3 to Phe-8, Lys-43 to Glu-48, Gly-62 to Pro-71.	S0015: 1, H0561: 1, S0440: 1, H0641: 1, H0646: 1, H0649: 1, S0210: 1, L0520: 1, L0378: 1, L0666: 1, S0374: 1, L0565: 1, H0547: 1, S0146: 1, H0436: 1, H0631: 1, L0779: 1, L0752: 1, S0260: 1, H0707: 1, L0596: 1, L0588: 1, L0485: 1, L0608: 1, L0593: 1, L0594: 1, H0653: 1 and H0422: 1.		
		810432	261	1 - 513	585				
		1154798	64	1 - 540	388				
54	HSKHS71	911592	262	1 - 381	586	Ala-94 to Cys-100.	AR089: 6, AR061: 4 S3014: 2		
		1181020	65	606 - 118	389	Pro-5 to Lys-12, Pro-18 to Arg-37, Asn-56 to Gly-63, Ser-75 to Arg-83,			
55	HISBT75						AR089: 6, AR061: 5 L0766: 6, L0748: 3, L0779: 3, S0360: 2, H0545: 2, H0494: 2,		

						Gly-147 to Gly-156.	L0769: 2, L0731: 2, L0759: 2, L0599: 2, H0295: 1, L0622: 1, L0021: 1, H0052: 1, H0546: 1, H0457: 1, H0086: 1, H0123: 1, H0413: 1, L0646: 1, L0768: 1, L0381: 1, L0659: 1, L0783: 1, L0809: 1, L0790: 1, L0666: 1, L0663: 1, H0539: 1, S3012: 1, L0747: 1, S0276: 1, H0543: 1 and H0352: 1.	
						Ala-8 to Gly-13, Gln-58 to Cys-67, His-94 to Tyr-99, Ser-107 to Ala-112.		
56	HFVKF77	930964	66	3787 - 1541	390	Glu-29 to Leu-37, Ser-47 to Glu-53, Glu-87 to Gln-92, Asn-112 to Ala-119.	AR089: 8, AR061: 7 H0046: 7, H0521: 7, H0052: 6, L0465: 6, H0031: 5, H0624: 4, S0358: 4, H0580: 4, S0010: 4, S0346: 4, H0551: 4, S0212: 3, S0418: 3, S0007: 3, H0437: 3, H0156: 3, H0575: 3, H0457: 3,	

						L0471: 3, T0010: 3, S0250: 3, H0328: 3, H0644: 3, H0040: 3, H0494: 3, S0344: 3, S0002: 3, H0144: 3, L0438: 3, H0520: 3, S0152: 3, H0665: 3, S0001: 2, H0402: 2, S0360: 2, S0046: 2, H0393: 2, H0549: 2, H0013: 2, H0069: 2, H0318: 2, H0373: 2, H0051: 2, S0214: 2, H0553: 2, S0036: 2, H0591: 2, H0038: 2, H0616: 2, L0370: 2, H0529: 2, H0519: 2, H0539: 2, L0602: 2, L0439: 2, L0591: 2, S0026: 2, H0423: 2, H0171: 1, L0615: 1, S0040: 1, H0656: 1, S0354: 1, H0329: 1, H0369: 1, H0431: 1, H0600: 1, H0586: 1, H0559: 1, H0270: 1, H0635: 1, H0427: 1, H0590: 1, T0071: 1,
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57	HJABW64	931402	67	1 - 465	391	Ala-26 to Thr-33, Ser-52 to Glu-58, Thr-83 to Leu-92.	H0581: 1, N0006: 1, H0123: 1, H0024: 1, L0146: 1, H0014: 1, S0003: 1, H0615: 1, H0039: 1, H0622: 1, H0030: 1, H0124: 1, H0598: 1, H0090: 1, L0060: 1, H0272: 1, S0015: 1, H0561: 1, S0440: 1, H0641: 1, H0646: 1, H0649: 1, S0210: 1, L0520: 1, L0378: 1, L0666: 1, S0374: 1, L0565: 1, H0547: 1, S0146: 1, H0436: 1, H0631: 1, L0779: 1, L0752: 1, S0260: 1, H0707: 1, L0596: 1, L0588: 1, L0485: 1, L0608: 1, L0593: 1, L0594: 1, H0653: 1 and H0422: 1.		
						AR061: 3, AR089: 2, H0266: 4, L0588: 4, L0592: 4, L0595: 4, H0144: 3, S0046: 2, H0013: 2, S0003: 2, L0766: 2, H0519: 2,			

									H0539: 2, L0750: 2, L0777: 2, L0758: 2, L0759: 2, S0242: 2, S0424: 2, H0624: 1, S0040: 1, S0420: 1, L0005: 1, S0356: 1, H0357: 1, H0052: 1, H0009: 1, H0570: 1, S0051: 1, H0038: 1, H0413: 1, T0069: 1, T0041: 1, H0494: 1, L0369: 1, L0794: 1, L0649: 1, L0803: 1, L0650: 1, L0651: 1, L0666: 1, H0520: 1, H0435: 1, H0658: 1, H0666: 1, H0214: 1, S0028: 1, L0439: 1, L0755: 1 and L0593: 1.				
58	HCEMY90	932927	68	49 - 606	392				AR089: 0, AR061: 0 H0090: 2, H0052: 1 and L0439: 1.				
59	HHFLF63	933854	69	1 - 669	393	Gly-1 to Trp-7, Gln-47 to Ser-54, Glu-105 to Asn-110, Thr-115 to Asp-123, Glu-147 to Asp-152, Glu-161 to Asn-167,			AR061: 9, AR089: 7 L0766: 3, H0457: 2, H0551: 2, H0529: 2, L0527: 2, H0144: 2, S0152: 2, H0521: 2, L0759: 2, H0343: 2,				

60	HSKAN19	935229	70	34 - 1212	394	Arg-1 to Glu-8, Ser-249 to Glu-254.	Pro-188 to Lys-195.	H0542: 2, H0624: 1, H0306: 1, H0619: 1, L0586: 1, H0013: 1, H0635: 1, H0327: 1, H0615: 1, H0591: 1, S0002: 1, L0796: 1, L0805: 1, L0791: 1, L0745: 1, L0750: 1, L0780: 1, L0731: 1, L0599: 1 and H0422: 1.		
								AR061: 9, AR089: 4, L0731: 8, L0803: 4, L0665: 3, L0756: 3, S0358: 2, L0637: 2, L0662: 2, L0666: 2, L0777: 2, L0595: 2, H0170: 1, H0662: 1, L0005: 1, S0222: 1, H0409: 1, H0486: 1, S0388: 1, H0428: 1, H0561: 1, S0450: 1, H0538: 1, H0529: 1, L0800: 1, L0764: 1, L0794: 1, L0766: 1, L0774: 1, L0659: 1, L0783: 1, L0663: 1, L0664: 1, H0521: 1, H0436: 1, S3014: 1,		

									S0027: 1, L0748: 1, L0755: 1, L0759: 1, H0445: 1, L0591: 1, H0543: 1 and H0506: 1.			
61	HE9SE88	1152240	71	554 - 3	395	Leu-88 to Pro-94, His-164 to Pro-174.			AR061: 6, AR089: 3 H0013: 1, H0144: 1 and H0521: 1.			
		894905	264	1 - 408	588							
62	HDTDG41	942490	72	197 - 580	396				AR089: 26, AR061: 5 L0731: 10, L0105: 7, S0360: 6, H0171: 5, H0251: 5, H0624: 4, L0794: 4, L0659: 4, H0144: 4, H0170: 3, H0486: 3, L0803: 3, H0013: 2, L0750: 2, L0777: 2, L0755: 2, L0581: 2, H0661: 1, S0376: 1, H0329: 1, L0717: 1, H0369: 1, H0587: 1, H0427: 1, H0309: 1, H0123: 1, L0471: 1, L0163: 1, H0039: 1, H0622: 1, H0163: 1, H0379: 1, L0598: 1, L0763: 1, L0662: 1, L0664: 1, H0658: 1, S0380: 1,			

								S0332: 1, S0028: 1, S0192: 1, S0196: 1 and S0458: 1.			
63	HTEPX32	870698	73	91 - 699	397	Ser-10 to Gly-15, Pro-20 to Ser-27, Glu-34 to Gly-41, Ala-45 to Trp-50, Pro-79 to Gly-88.		AR089: 11, AR061: 2 H0038: 6, H0616: 6, L0794: 4, L0768: 1 and L0758: 1.			
64	HEGAB84	1128320	74	475 - 17	398			AR089: 13, AR061: 8 H0618: 2 and H0550: 1.			
		823900	265	1 - 351	589	Ile-30 to Gly-36, Thr-67 to Thr-72.					
65	HTEKQ12	1213746	75	1 - 1869	399	Gly-15 to Arg-21, Pro-30 to Ser-35, Ser-44 to Asp-51, Pro-109 to Phe-115, Glu-131 to Ser-139, Arg-166 to Ser-179, Gly-205 to Gly-215, Ser-234 to Arg-252, Arg-279 to Glu-288, Leu-355 to Cys-362, Glu-371 to His-376, Thr-393 to Asp-401, Arg-506 to Asn-512, Asp-571 to Lys-578, Pro-580 to Pro-592.		AR089: 1, AR061: 0 H0253: 27, H0618: 21, H0038: 14, L0439: 13, L0758: 5, H0616: 4, L0794: 4, L0803: 4, H0556: 2, L0438: 2, L0608: 2, H0265: 1, H0676: 1, H0559: 1, H0355: 1, H0510: 1, H0375: 1, H0617: 1, H0413: 1, H0647: 1, H0646: 1, L0644: 1, L0773: 1, L0774: 1, L0790: 1, H0520: 1, H0547: 1, H0690: 1.			

					Lys-601 to Leu-608.				L0779: 1, H0543: 1 and H0506: 1.		
		947964	266	2 - 472	Ser-9 to Asp-16, Pro-74 to Phe-80, Lys-85 to Gly-91.	590					
66	HNTSX71	1221117	76	230 - 1417	Ser-26 to Val-32, Ala-60 to Trp-66.	400			AR089: 15, AR061: 2 S0126: 4, H0135: 3, H0494: 3, H0547: 3, S0045: 2, H0550: 2, H0545: 2, H0242: 2, H0266: 2, H0551: 2, H0653: 2, S0040: 1, S0282: 1, S0358: 1, S0376: 1, S0046: 1, H0393: 1, S6022: 1, H0549: 1, H0156: 1, H0618: 1, H0253: 1, H0123: 1, H0050: 1, H0024: 1, H0014: 1, H0252: 1, H0124: 1, H0040: 1, H0623: 1, S0370: 1, S0210: 1, L0648: 1, L0518: 1, S0374: 1, H0435: 1, S0328: 1, S0152: 1 and S0404: 1.		
		963289	267	2 - 436	Pro-6 to Arg-14, Gly-97 to Asp-109.	591					

67	HFCFH75	951202	77	2 - 646	401	<p>Pro-118 to Cys-123, Cys-135 to Ser-140.</p> <p>Pro-9 to Arg-17, Gly-100 to Asp-112, Pro-121 to Cys-126, Cys-138 to Ser-143.</p> <p>Ser-75 to Lys-80, Arg-167 to Lys-172.</p>	<p>AR089: 9, AR061: 7 H0266: 4, L0588: 4, L0592: 4, L0595: 4, H0144: 3, S0046: 2, H0013: 2, S0003: 2, L0766: 2, H0519: 2, H0539: 2, L0750: 2, L0777: 2, L0758: 2, L0759: 2, S0242: 2, S0424: 2, H0624: 1, S0040: 1, S0420: 1, L0005: 1, S0356: 1, H0357: 1, H0052: 1, H0009: 1, H0570: 1, S0051: 1, H0038: 1, H0413: 1, T0069: 1, T0041: 1, H0494: 1, L0369: 1, L0794: 1, L0649: 1, L0803: 1, L0650: 1, L0651: 1, L0666: 1, H0520: 1, H0435: 1, H0658: 1,</p>
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68	HOOY55	1204693	78	1323 - 1	402	Ser-15 to Cys-21, Leu-52 to Ser-58, Gly-161 to Glu-167, Arg-282 to Arg-289, Ser-340 to Gln-345, Arg-375 to Gln-381, Gly-392 to Ala-399, Pro-401 to Trp-406.	H0666: 1, H0214: 1, S0028: 1, L0439: 1, L0755: 1 and L0593: 1. AR089: 1, AR061: 1 L0748: 15, L0439: 6, H0457: 4, H0009: 3, H0620: 3, L0438: 3, S0212: 2, H0559: 2, H0673: 2, H0690: 2, H0265: 1, H0341: 1, H0305: 1, S0418: 1, S0360: 1, S0045: 1, S0140: 1, S0278: 1, H0549: 1, T0109: 1, H0069: 1, H0590: 1, H0618: 1, T0048: 1, H0581: 1, H0052: 1, H0050: 1, L0185: 1, H0271: 1, H0213: 1, H0617: 1, H0040: 1, H0551: 1, H0264: 1, L0769: 1, L0638: 1, L0761: 1, L0644: 1, L0771: 1, L0649: 1, L0657: 1, L0809: 1, L0666: 1, L0665: 1, H0519: 1, H0689: 1, H0435: 1, S0044: 1,		
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									S0390: 1, S0037: 1, S3014: 1, L0742: 1, L0754: 1, L0747: 1, H0543: 1 and H0422: 1.		
		883406	269	73 - 840	593			Gly-5 to Arg-12, Ile-52 to Thr-61, Val-85 to Gly-92, Tyr-114 to Thr-121, Lys-133 to Pro-138, Thr-186 to Arg-192.			
69	HPJDQ48	952185	79	194 - 559	403			Arg-1 to Ser-14, Glu-46 to Glu-51.	AR089: 12, AR061: 3 L0766: 3, H0633: 2, H0125: 1, H0050: 1, H0560: 1, L0783: 1, S0152: 1 and H0521: 1.		
70	HTTCB17	1174865	80	8 - 2041	404			Ala-1 to Gly-12.	AR061: 7, AR089: 4 L0766: 8, L0748: 7, H0038: 4, H0543: 4, L0779: 3, H0624: 2, S0007: 2, H0083: 2, L0805: 2, L0666: 2, H0547: 2, L0439: 2, L0777: 2, L0758: 2, L0596: 2, L0599: 2, S0026: 2, H0657: 1, S0212: 1, H0255: 1, S0420: 1, S0358: 1, S0444: 1, S0360: 1,		

									H0431: 1, S0414: 1, H0004: 1, S0010: 1, H0597: 1, H0546: 1, H0354: 1, H0266: 1, H0383: 1, H0361: 1, H0040: 1, H0616: 1, L0151: 1, H0264: 1, H0560: 1, L0520: 1, L0640: 1, L0638: 1, L0794: 1, L0803: 1, L0375: 1, L0806: 1, L0655: 1, L0663: 1, H0520: 1, H0519: 1, H0670: 1, H0672: 1, S0146: 1, H0555: 1, L0752: 1, L0731: 1, L0759: 1, S0031: 1, H0445: 1, L0595: 1 and L0366: 1.			

73	HCHMO62	955551	83	3 - 362	407	Gln-102 to Pro-108.	1. AR089: 10, AR061: 4 H0341: 1 and H0484: 1.		
74	HHSDM19	956045	84	1789 - 1730	408		AR061: 3, AR089: 2 H0266: 4, L0588: 4, L0592: 4, L0595: 4, H0144: 3, S0046: 2, H0013: 2, S0003: 2, L0766: 2, H0519: 2, H0539: 2, L0750: 2, L0777: 2, L0758: 2, L0759: 2, S0242: 2, S0424: 2, H0624: 1, S0040: 1, S0420: 1, L0005: 1, S0356: 1, H0357: 1, H0052: 1, H0009: 1, H0570: 1, S0051: 1, H0038: 1, H0413: 1, T0069: 1, T0041: 1, H0494: 1, L0369: 1, L0794: 1, L0649: 1, L0803: 1, L0650: 1, L0651: 1, L0666: 1, H0520: 1, H0435: 1, H0658: 1, H0666: 1, H0214: 1, S0028: 1, L0439: 1,		

75	HDTIT49	956917	85	854 - 3	409	Lys-93 to Gln-98, Asp-141 to Leu-148, Asn-166 to Pro-172, Glu-174 to Gln-179, Ser-187 to Lys-192, Gln-221 to Gln-229, Pro-239 to Asp-246.	L0755: 1 and L0593: 1, AR089: 1, AR061: 0 L0803: 8, S0414: 6, L0740: 6, L0757: 5, L0439: 4, L0747: 4, L0759: 4, S0412: 4, H0486: 3, L0598: 3, L0770: 3, L0662: 3, L0794: 3, L0775: 3, L0655: 3, L0666: 3, L0731: 3, L0599: 3, S0114: 2, S0212: 2, H0024: 2, S0003: 2, H0328: 2, H0615: 2, H0070: 2, H0591: 2, H0059: 2, L0768: 2, L0665: 2, L0438: 2, H0659: 2, H0658: 2, S0330: 2, L0746: 2, L0756: 2, L0758: 2, L0362: 2, H0170: 1, H0656: 1, L0808: 1, S0356: 1, S0354: 1, S0358: 1, S0360: 1, T0008: 1, H0013: 1, H0069: 1, H0156: 1, H0599: 1, H0098: 1, H0575: 1, S0346: 1,		
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76	HTLGW19	1163072	86	3 - 1034	410	Val-52 to Arg-57, Ala-128 to Asp-134, Val-148 to Glu-154, Gln-290 to Leu-298.	T0115: 1, H0046: 1, H0563: 1, H0373: 1, L0163: 1, H0316: 1, H0551: 1, T0041: 1, H0652: 1, S0422: 1, L0369: 1, L0638: 1, L0637: 1, L0761: 1, L0521: 1, L0363: 1, L0766: 1, L0649: 1, L0804: 1, L0784: 1, L0806: 1, L0805: 1, L0659: 1, L0787: 1, L0788: 1, L0792: 1, L0663: 1, S0052: 1, H0144: 1, H0519: 1, S0126: 1, H0684: 1, H0435: 1, H0670: 1, H0518: 1, H0521: 1, H0696: 1, H0555: 1, L0748: 1, L0779: 1, L0752: 1, S0242: 1, H0543: 1, H0423: 1, S0424: 1 and H0506: 1.		
							AR061: 5, AR089: 3 L0770: 2, L0766: 2, L0803: 2, L0439: 2, L0751: 2, L0757: 2, H0422: 2, L0785: 1,		

									S0360: 1, H0619: 1, S0278: 1, H0250: 1, H0618: 1, H0253: 1, T0110: 1, H0050: 1, S0051: 1, S0250: 1, H0252: 1, H0615: 1, H0212: 1, H0264: 1, L0351: 1, H0560: 1, S0144: 1, L0762: 1, L0378: 1, L0806: 1, L0653: 1, L0659: 1, L0790: 1, S0126: 1, H0690: 1, H0521: 1, H0576: 1, S0028: 1, L0779: 1, L0780: 1 and L0758: 1.							
									Val-51 to Arg-56, Ala-127 to Asp-133, Val-147 to Glu-153.	595	261 - 1553	271	788606			
77	HJPCA88								Gly-8 to Cys-13, Gln-38 to Met-48, Arg-76 to Gln-82, Cys-87 to Asp-94.	411	2 - 562	87	958942		AR061: 0, AR089: 0 S0116: 1, H0438: 1, H0083: 1, S0364: 1, H0560: 1 and H0539: 1.	
78	HE9TA54								Cys-22 to Cys-31, Leu-35 to Pro-54, Gln-59 to Glu-73, Arg-131 to Met-140, Asn-149 to Arg-156,	412	2 - 1399	88	960253		AR089: 9, AR061: 9 H0251: 12, H0013: 6, L0759: 5, H0351: 4, H0373: 4, H0529: 4, L0766: 4, L0754: 4,	

Ser-191 to Thr-196, Leu-299 to Leu-313, Glu-328 to Pro-336, Val-393 to Asp-399, Asn-454 to Asn-466.	L0750: 4, L0777: 4, L0666: 3, H0684: 3, L0439: 3, S0442: 2, H0318: 2, H0553: 2, H0551: 2, H0412: 2, T0042: 2, S0422: 2, L0649: 2, H0144: 2, H0539: 2, L0731: 2, L0757: 2, H0445: 2, L0592: 2, L0608: 2, H0624: 1, H0685: 1, H0656: 1, H0306: 1, L0005: 1, S0356: 1, H0261: 1, H0550: 1, H0592: 1, H0587: 1, H0635: 1, H0581: 1, H0421: 1, H0052: 1, H0263: 1, H0546: 1, L0471: 1, L0163: 1, H0083: 1, H0594: 1, H0622: 1, H0068: 1, H0634: 1, H0379: 1, H0264: 1, T0041: 1, H0494: 1, H0560: 1, H0633: 1, L0769: 1, L0772: 1, L0764: 1, L0771: 1, L0773: 1, L0662: 1, L0794: 1,
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79	HCFCD40	963756	89	1355 - 3004	413	Gln-11 to Glu-19, Ser-61 to Ser-71, Ser-76 to Ser-84, Pro-111 to Ser-124, Ala-153 to Ser-161, Ser-177 to Gly-182, Asp-197 to Asn-205, Ser-219 to Ser-225.	L0388: 1, L0522: 1, L0803: 1, L0629: 1, L0657: 1, L0519: 1, L0789: 1, L0663: 1, L0665: 1, S0374: 1, H0547: 1, H0365: 1, H0670: 1, S0330: 1, S0378: 1, S0152: 1, S3014: 1, S0027: 1, L0747: 1, L0749: 1, L0601: 1, H0653: 1, H0543: 1 and H0422: 1. AR089: 4, AR061: 2 L0439: 7, L0748: 6, L0747: 6, L0749: 6, H0013: 4, H0265: 3, H0556: 3, S0360: 3, H0581: 3, L0471: 3, H0622: 3, L0662: 3, H0543: 3, S0218: 2, S0358: 2, L0717: 2, S0222: 2, H0486: 2, H0263: 2, H0545: 2, H0040: 2, H0056: 2, L0770: 2, L0517: 2, L0666: 2, H0519: 2, L0602: 2, S0027: 2, L0740: 2, L0754: 2,		
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	L0759: 2, L0596: 2, H0542: 2, S0134: 1, L0415: 1, H0341: 1, S0212: 1, H0663: 1, S0418: 1, S0354: 1, H0637: 1, S0007: 1, H0208: 1, S0132: 1, H0619: 1, H0393: 1, H0586: 1, H0587: 1, H0574: 1, T0039: 1, S0280: 1, H0036: 1, S0049: 1, H0196: 1, H0046: 1, H0123: 1, H0023: 1, L0163: 1, T0010: 1, H0615: 1, T0006: 1, H0031: 1, H0553: 1, H0032: 1, H0551: 1, H0623: 1, T0041: 1, H0494: 1, H0560: 1, H0633: 1, H0538: 1, L0769: 1, L0667: 1, L0646: 1, L0800: 1, L0767: 1, L0768: 1, L0766: 1, L0774: 1, L0775: 1, L0375: 1, L0776: 1, L0606: 1, L0657: 1, L0659: 1, L0543: 1,								
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80	HHBEN77	1189720	90	2 - 1009	414	Pro-1 to Asp-10, Arg-24 to Leu-42, Val-65 to Ser-75, Arg-95 to Asp-104, Glu-111 to Ile-119, Asp-151 to Arg-157, His-212 to Leu-222, Ala-251 to Gly-256, His-309 to Ala-314, Gly-321 to Gln-331.	L0647: 1, L0791: 1, L0663: 1, S0053: 1, L0565: 1, L0352: 1, H0520: 1, H0547: 1, H0435: 1, H0539: 1, H0521: 1, S0028: 1, S0206: 1, L0741: 1, L0756: 1, L0779: 1, L0731: 1, L0757: 1, L0758: 1, S0260: 1, L0605: 1, H0653: 1, H0667: 1, H0422: 1 and H0506: 1.		
		951627	272	2 - 790	596	Pro-1 to Asp-10, Arg-24 to Leu-42, Val-65 to Ser-75, Arg-95 to Asp-104, Glu-111 to Ile-119,	AR089: 3, AR061: 3 H0599: 45, S0364: 8, H0002: 3, S0366: 3, L0803: 3, L0622: 2, L0623: 2, H0016: 2, L0604: 2, H0097: 1, H0122: 1, H0196: 1, H0373: 1, H0553: 1, H0040: 1, H0634: 1, L0769: 1 and L0783: 1.		

81	HHESP66	1154641	91	111 - 830	415	Asp-151 to Arg-157. Lys-1 to Ser-18, Asn-49 to Glu-62, Gln-67 to Ser-76, Glu-84 to Thr-90, Thr-104 to Pro-112, Ser-148 to Arg-156, Gly-184 to Thr-191, Pro-203 to Glu-210, Thr-234 to Ser-240.	AR061: 2, AR089: 2 L0766: 6, L0665: 4, H0650: 2, H0402: 2, S0360: 2, L0794: 2, L0803: 2, L0592: 2, S0134: 1, S0278: 1, H0251: 1, H0263: 1, H0321: 1, H0591: 1, H0551: 1, S0422: 1, L0645: 1, L0764: 1, L0809: 1, L0788: 1, L0666: 1, L0663: 1, S0052: 1, H0547: 1, H0134: 1, S0404: 1, H0478: 1, L0740: 1, L0754: 1, L0779: 1, L0777: 1, L0755: 1, L0758: 1, H0543: 1 and S0384: 1.		
		919192	273	107 - 667	597	Lys-1 to Ser-18, Asn-49 to Glu-62, Gln-67 to Ser-76, Glu-84 to Thr-90, Thr-104 to Pro-112.			
82	HAHHQ37	967442	92	59 - 1993	416	Leu-35 to Lys-41, Leu-61 to Glu-68, Ser-153 to Gln-158,	AR061: 2, AR089: 1 H0618: 4, H0584: 3, H0592: 3, H0253: 3,		

						Asn-223 to Pro-228, Ala-259 to Phe-266, Pro-276 to Gly-283, Asp-292 to Phe-307, Ala-318 to Asp-336, Pro-348 to Leu-365, Ala-369 to Thr-393, Gln-398 to Ala-408.	H0587: 2, H0599: 2, H0457: 2, H0521: 2, H0583: 1, H0484: 1, H0402: 1, S0354: 1, S0358: 1, H0590: 1, H0634: 1, H0529: 1, H0697: 1, L0750: 1, H0136: 1, H0423: 1 and H0677: 1.		
83	HAMAA10	968749	93	73 - 972	417	Gly-4 to Ala-19.	AR089: 1, AR061: 0 L0604: 6, L0485: 2, L0623: 1, H0122: 1, H0373: 1, L0809: 1 and L0584: 1.		
84	HHFMH12	969324	94	2 - 2170	418	Asp-21 to Tyr-27, Pro-66 to Leu-72, Glu-99 to Ala-105, Gly-111 to Val-120, Gln-132 to Ile-138, Asp-152 to Ala-159, Lys-165 to Arg-170, Thr-222 to Cys-229, Arg-265 to Tyr-270, Ser-274 to Asp-283, Asp-299 to Ser-306, Val-316 to Arg-322, Asp-333 to Lys-346, Ser-447 to Arg-452,	AR061: 3, AR089: 1 L0601: 7, H0622: 4, S0380: 4, S0356: 3, T0010: 3, S0038: 3, L0769: 3, S0360: 2, L0157: 2, H0623: 2, S0306: 2, L0770: 2, L0662: 2, L0659: 2, S3014: 2, L0759: 2, H0556: 1, H0295: 1, S0114: 1, S0134: 1, S0046: 1, S0132: 1, H0619: 1, H0393: 1, L0717: 1, S0222: 1,		

						S6014: 1, H0370: 1, H0586: 1, T0040: 1, H0635: 1, H0036: 1, T0048: 1, H0052: 1, H0194: 1, H0263: 1, H0231: 1, H0050: 1, H0023: 1, H0014: 1, H0083: 1, H0266: 1, S0250: 1, L0483: 1, H0048: 1, H0321: 1, S0036: 1, H0040: 1, H0634: 1, H0551: 1, H0272: 1, H0433: 1, H0412: 1, H0413: 1, H0100: 1, T0041: 1, H0494: 1, S0144: 1, S0210: 1, L0803: 1, L0655: 1, L0809: 1, L0663: 1, H0691: 1, H0520: 1, H0519: 1, H0435: 1, S0044: 1, S0027: 1, L0742: 1, L0748: 1, L0749: 1, L0756: 1, L0777: 1, L0753: 1, L0731: 1, L0758: 1, L0366: 1, H0665: 1, S0242: 1, S0194: 1, H0543: 1 and
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85	HDTIE58	971339	95	393 - 2315	419	Ser-9 to Cys-21, Asn-137 to Leu-142, Gly-231 to Thr-236, Arg-284 to Phe-291, Asn-305 to Asp-313, Ala-375 to Asn-383, Cys-404 to Arg-411, Val-456 to Glu-469, Glu-516 to Leu-521, Lys-572 to Tyr-588.	H0008: 1. AR089: 4, AR061: 3 S0045: 1, H0600: 1, H0486: 1 and L0809: 1.		
86	HIBCN93	973679	96	207 - 938	420	Met-26 to Asn-37, Glu-42 to Gln-51, Thr-68 to Ser-95, Ala-97 to Lys-113, Asp-156 to Val-161, Val-208 to Asp-215, Pro-217 to Ala-228.	AR089: 2, AR061: 1 L0740: 12, L0439: 10, L0766: 7, L0769: 4, L0794: 4, L0756: 4, H0549: 3, L0768: 3, L0803: 3, L0665: 3, S0206: 3, L0750: 3, H0423: 3, S0007: 2, S0010: 2, S0346: 2, H0052: 2, H0327: 2, H0024: 2, H0051: 2, L0763: 2, L0770: 2, H0144: 2, L0758: 2, H0556: 1, L0760: 1, S0626: 1, S0300: 1, H0550: 1, S0222: 1, H0392: 1, H0331: 1,	6q21-q23.2	107470, 107470, 107470, 120110, 121014, 164200, 164200, 601316, 601666, 601757, 602772

87	HSWAP86	1165386	97	253 - 786	421	Pro-5 to Lys-12, Pro-18 to Arg-37, Asn-56 to Gly-63, Ser-75 to Arg-83.	H0013: 1, H0318: 1, S0049: 1, H0194: 1, H0103: 1, H0050: 1, L0471: 1, H0620: 1, H0373: 1, S0388: 1, T0010: 1, H0399: 1, H0553: 1, H0644: 1, H0032: 1, H0124: 1, H0068: 1, S0036: 1, H0135: 1, H0038: 1, H0616: 1, H0551: 1, T0067: 1, H0100: 1, H0560: 1, H0561: 1, L0662: 1, L0649: 1, L0774: 1, L0517: 1, L0809: 1, L0647: 1, L0789: 1, L0792: 1, L0352: 1, S0126: 1, H0539: 1, S0380: 1, H0518: 1, S0004: 1, S0044: 1, S3014: 1, L0748: 1, L0747: 1, L0686: 1, L0592: 1, S0196: 1 and H0352: 1.		
						AR089: 3, AR061: 2 L0766: 6, L0748: 3, L0779: 3, S0360: 2, H0545: 2, H0494: 2,			

88	HHS	947000	274	3 - 281	598	Thr-1 to Pro-8, Gln-42 to Cys-51, His-78 to Tyr-83.	L0769: 2, L0731: 2, L0759: 2, L0599: 2, H0295: 1, L0622: 1, L0021: 1, H0052: 1, H0546: 1, H0457: 1, H0086: 1, H0123: 1, H0413: 1, L0646: 1, L0768: 1, L0381: 1, L0659: 1, L0783: 1, L0809: 1, L0790: 1, L0666: 1, L0663: 1, H0539: 1, S3012: 1, L0747: 1, S0276: 1, H0543: 1 and H0352: 1.		
		948606	275	737 - 477	599	Ser-36 to Gln-43, Ala-109 to Ser-123, Leu-147 to Glu-157, Pro-173 to Thr-178, Thr-197 to Thr-202, Lys-208 to Asn-222, Gly-230 to Asp-252, Glu-262 to Gly-274, Glu-304 to Arg-311, His-420 to Gly-425.	AR061: 2, AR089: 1 L0803: 6, L0742: 5, H0599: 4, H0620: 4, L0766: 4, L0748: 4, L0439: 4, S0222: 3, L0809: 3, L0749: 3, S0282: 2, T0039: 2, L0435: 2, L0666: 2, L0665: 2, L0438: 2, L0756: 2, L0753: 2,		
		1216549	98	3 - 1745	422				

His-524 to Gly-530, Lys-557 to Phe-580.	S0031: 2, L0588: 2, S0356: 1, S0354: 1, S0358: 1, S0360: 1, H0393: 1, S6016: 1, H0431: 1, H0592: 1, H0643: 1, H0331: 1, H0574: 1, H0013: 1, H0575: 1, H0590: 1, S0010: 1, H0581: 1, S0049: 1, H0327: 1, H0012: 1, H0024: 1, H0014: 1, L0163: 1, S0388: 1, S0051: 1, S6028: 1, H0622: 1; H0032: 1, H0163: 1, H0038: 1, H0413: 1, H0059: 1, L0520: 1, L0770: 1, L0761: 1, L0772: 1, L0643: 1, L0764: 1, L0662: 1, L0767: 1, L0804: 1, L0775: 1, L0805: 1, L0657: 1, L0659: 1, L0790: 1, L0663: 1, L0352: 1, H0547: 1, H0689: 1, H0648: 1, H0555: 1, L0751: 1, L0779: 1, L0777: 1,
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89	HAJBH69	958555	276	142 - 1194	600	Leu-33 to Gln-39.	L0758: 1 and L0759: 1. AR089: 2, AR061: 2 H0253: 7, L0794: 7, L0761: 5, L0758: 5, H0402: 4, S0358: 3, H0586: 3, H0618: 3, H0457: 3, S0002: 3, L0766: 3, L0774: 3, L0659: 3, L0666: 3, H0484: 2, H0551: 2, L0770: 2, L0764: 2, L0649: 2, H0684: 2, H0670: 2, H0539: 2, H0696: 2, L0748: 2, L0779: 2, H0543: 2, H0306: 1, S0420: 1, L0617: 1, H0580: 1, S0046: 1, H0261: 1, H0592: 1, H0485: 1, H0590: 1, T0048: 1, H0318: 1, H0421: 1, H0052: 1, H0530: 1, H0179: 1, H0188: 1, H0622: 1, H0617: 1, H0124: 1, H0135: 1, H0038: 1, H0264: 1, H0413: 1, H0623: 1.	22q13.31	250100, 250800, 250800
		812164	99	3 - 323	423	Asn-15 to Glu-24.			

								L0351: 1, H0494: 1, H0561: 1, H0641: 1, S0422: 1, L0763: 1, L0769: 1, L0667: 1, L0646: 1, L0800: 1, L0643: 1, L0644: 1, L0771: 1, L0662: 1, L0768: 1, L0386: 1, L0533: 1, L0806: 1, L0653: 1, L0657: 1, L0664: 1, H0691: 1, H0518: 1, H0521: 1, S0404: 1, H0436: 1, L0743: 1, L0777: 1 and L0600: 1.		
90	HAGFN07	953606	100	797 - 357	424			AR089: 38, AR061: 7 L0731: 2 and S0010: 1.		
91	HFRBZ64	575037	101	217 - 660	425	Glu-51 to Phe-60, Gln-63 to Gly-73, Thr-85 to Lys-91.		AR089: 3, AR061: 0 S0001: 1, S0050: 1 and H0181: 1.		
92	HMAER78	702735	102	3 - 272	426	Asp-77 to Lys-82.		AR061: 243, AR089: 175 S0050: 1, S0144: 1, S0052: 1 and S0028: 1.		
93	HKAAV49	1179713	103	1 - 1923	427	Pro-1 to Lys-13, Pro-20 to Lys-39, Ala-46 to Thr-71, Pro-112 to Gln-122,		AR089: 11, AR061: 2 L0766: 14, L0761: 3, L0792: 3, L0779: 3, L0717: 2, H0135: 2,		

						Gly-129 to Arg-151, Gly-159 to Ile-164, Ala-188 to Tyr-194, Asn-208 to Pro-217, Gly-237 to Thr-249, Gly-267 to Ala-285, Ser-292 to Phe-303, Lys-305 to Ala-319, Asp-330 to Arg-337, Leu-347 to Asn-358, Val-368 to Ala-378, Thr-390 to Asp-395, Ser-417 to Arg-445, Phe-449 to Leu-476, Ala-510 to Lys-532, Ser-546 to Glu-562, Lys-570 to Ser-589, Val-609 to Glu-623.					H0264: 2, L0809: 2, L0790: 2, L0791: 2, L0666: 2, L0591: 2, S0134: 1, H0650: 1, H0657: 1, H0483: 1, H0580: 1, H0486: 1, H0013: 1, H0575: 1, H0590: 1, H0581: 1, H0050: 1, H0024: 1, S0364: 1, H0163: 1, L0351: 1, T0042: 1, H0494: 1, H0633: 1, S0422: 1, S0002: 1, L0770: 1, L0769: 1, L0796: 1, L0764: 1, L0662: 1, L0794: 1, L0804: 1, L0606: 1, L0783: 1, L0777: 1, S0194: 1 and H0543: 1.				
						Glu-5 to Lys-10, Pro-17 to Lys-36, Ala-43 to Thr-68, Pro-109 to Gln-119, Gly-126 to Arg-148, Gly-156 to Ile-161, Ala-185 to Asp-192.	601	188 - 796	277	961297					
						Thr-15 to Glu-20, Val-29 to Arg-39,	428	774 - 415	104	855538	HAPQS74				
94															

Pro-58 to Arg-66, Lys-95 to Phe-105, Val-109 to Ala-114.	L0439: 6, L0747: 6, L0740: 5, L0756: 5, L0779: 4, L0777: 4, L0731: 4, S0051: 3, L0803: 3, L0774: 3, L0754: 3, S0360: 2, H0574: 2, L0763: 2, L0805: 2, L0809: 2, L0663: 2, L0751: 2, L0755: 2, L0759: 2, L0601: 2, H0624: 1, S0040: 1, S0298: 1, S0420: 1, H0580: 1, H0351: 1, H0600: 1, H0331: 1, H0013: 1, L0021: 1, H0575: 1, H0590: 1, T0110: 1, H0012: 1, H0615: 1, H0031: 1, H0553: 1, H0591: 1, H0646: 1, S0002: 1, L0772: 1, L0645: 1, L0773: 1, L0662: 1, L0794: 1, L0381: 1, L0775: 1, L0776: 1, L0657: 1, L0659: 1, L0528: 1, L0790: 1, L0666: 1, H0547: 1, H0648: 1,
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									H0539: 1, S0152: 1, H0696: 1, S0044: 1, S0028: 1, L0758: 1, L0366: 1, S0011: 1, S0276: 1, H0422: 1 and S0424: 1.			
95	HTEPM33	870561	105	1 - 735	429	Pro-8 to Gly-26, Cys-54 to Cys-66, Gly-73 to His-85.			AR061: 25, AR089: 5 L0758: 3, H0616: 2, H0038: 1 and L0779: 1.			
96	HLTES49	872262	106	2 - 280	430	Ser-31 to Gly-43, Ser-45 to Gly-57.			AR089: 20, AR061: 7 H0090: 2, H0419: 1, H0483: 1, H0459: 1, S0045: 1, H0455: 1, H0642: 1, H0485: 1, H0486: 1, H0052: 1, H0239: 1, H0617: 1, T0042: 1, H0494: 1, H0641: 1, H0547: 1, S0044: 1, S0037: 1, L0742: 1, L0439: 1, L0755: 1 and H0543: 1.			
97	HDTEJ81	919873	107	1 - 474	431	Ser-37 to Gly-49, Ser-51 to Gly-63, Val-93 to Cys-98.			AR089: 1, AR061: 0 L0747: 13, L0755: 8, L0731: 8, L0750: 7, H0657: 6, L0758: 6, L0769: 4, H0617: 3, L0764: 3, L0439: 3, L0752: 3, H0090: 2,			

				H0641: 2, L0651: 2, L0776: 2, L0809: 2, H0144: 2, L0740: 2, L0749: 2, L0759: 2, S0276: 2, H0656: 1, H0419: 1, H0483: 1, H0459: 1, H0125: 1, S0360: 1, S0045: 1, H0455: 1, H0587: 1, H0642: 1, H0485: 1, H0486: 1, L0021: 1, H0318: 1, H0052: 1, H0544: 1, H0046: 1, H0239: 1, H0687: 1, H0606: 1, H0674: 1, H0059: 1, L0351: 1, T0042: 1, H0494: 1, S0144: 1, S0426: 1, L0770: 1, L0643: 1, L0771: 1, L0521: 1, L0767: 1, L0766: 1, L0551: 1, L0803: 1, L0774: 1, L0775: 1, L0655: 1, L0518: 1, L0782: 1, L0783: 1, L0383: 1, L0519: 1, L0528: 1, L0789: 1, S0052: 1, S0374: 1,				
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								L0352: 1, H0547: 1, H0666: 1, S0044: 1, S0037: 1, L0742: 1, L0748: 1, L0751: 1, L0780: 1, L0683: 1, L0599: 1 and H0543: 1.			
98	HTLCY21	910212	108	68 - 556	432	Leu-12 to Ser-19, Glu-108 to Ser-119, Ala-121 to Thr-128, Lys-139 to Ala-149, Arg-153 to Ala-161.		AR061: 1, AR089: 0 L0741: 2, H0618: 1, H0253: 1 and H0668: 1.			
99	HKAKF45	1090988	109	1 - 840	433	Gln-43 to Ser-49, Ala-60 to Gly-67.		AR061: 3, AR089: 2 H0494: 2 and H0690: 1.			
		911611	278	1 - 582	602	Gln-43 to Ser-49, Ala-60 to Gly-67, Arg-141 to Pro-146.					
100	HMWDF88	906769	110	147 - 362	434	Trp-14 to Asp-27.		AR061: 207, AR089: 155 H0341: 1 and H0083: 1.			
101	HHECU86	945062	111	1 - 585	435	Asp-15 to Leu-21, Ser-59 to His-66, Ile-159 to Tyr-164.		AR089: 5, AR061: 2 S0126: 3, H0551: 2, L0770: 2, L0748: 2, L0740: 2, H0542: 2, H0556: 1, S0116: 1, S0420: 1, S0360: 1, H0575: 1, H0581: 1,	6		

102	HTPHO01	1152424	112	868 - 2	436	Thr-7 to Pro-18, Thr-235 to Gly-240.	H0050: 1, H0641: 1, L0766: 1, L0649: 1, S0390: 1, L0745: 1, L0731: 1, L0593: 1 and H0543: 1. AR061: 4, AR089: 3 H0599: 25, L0731: 19, L0750: 14, L0754: 13, L0766: 8, L0776: 8, L0752: 8, L0757: 8, L0747: 6, L0744: 5, L0769: 4, L0779: 4, L0777: 4, S0420: 3, L0770: 3, L0755: 3, L0758: 3, L0471: 2, L0771: 2, L0775: 2, L0806: 2, L0659: 2, S0126: 2, H0670: 2, L0743: 2, L0759: 2, L0604: 2, H0624: 1, H0685: 1, H0650: 1, H0484: 1, H0483: 1, H0661: 1, S0358: 1, S0360: 1, S0046: 1, H0411: 1, H0632: 1, H0427: 1, S0280: 1, H0097: 1, H0004: 1, S0049: 1, H0028: 1,					
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103	HFXKR90	948399	113	589 - 2	437	Ile-11 to Arg-20, Pro-56 to Ala-69, Ser-81 to Glu-86, Asp-108 to Trp-116, Pro-142 to Gly-158, Cys-207 to Ser-213.	<p>H0622: 1, L0142: 1, H0591: 1, L0763: 1, L0772: 1, L0800: 1, L0764: 1, L0662: 1, L0768: 1, L0794: 1, L0774: 1, L0807: 1, L0809: 1, L0666: 1, L0665: 1, S0148: 1, S0328: 1, S0406: 1, S3014: 1, S0027: 1, S0028: 1, L0599: 1, S0026: 1 and H0667: 1.</p> <p>AR061: 3, AR089: 2 L0777: 8, H0549: 7, L0665: 6, L0751: 6, L0809: 5, L0439: 5, S0116: 3, S0354: 3, H0620: 3, H0083: 3, L0803: 3, L0774: 3, L0805: 3, L0659: 3, L0666: 3, H0696: 3, L0779: 3, L0601: 3.</p>		
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H0423: 3, H0656: 2, S0282: 2, H0483: 2, H0619: 2, H0486: 2, S0049: 2, H0309: 2, H0316: 2, L0763: 2, L0767: 2, L0776: 2, L0655: 2, L0657: 2, L0438: 2, H0520: 2, H0658: 2, L0602: 2, H0555: 2, H0624: 1, H0686: 1, H0295: 1, S0114: 1, H0657: 1, H0255: 1, S0358: 1, S0360: 1, H0340: 1, H0580: 1, S0046: 1, H0455: 1, H0333: 1, H0574: 1, H0559: 1, T0109: 1, H0156: 1, L0021: 1, T0074: 1, H0618: 1, H0318: 1, S0474: 1, H0581: 1, H0052: 1, H0327: 1, H0530: 1, H0562: 1, H0012: 1, H0687: 1, S0250: 1, H0615: 1, H0428: 1, L0483: 1, H0553: 1, H0673: 1, H0135: 1, H0059: 1,
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104	HDPBQ32	949191	114	3 - 1004	438	S0038: 1, H0494: 1, L0065: 1, H0207: 1, L0520: 1, L0640: 1, L0769: 1, L0638: 1, L0637: 1, L0761: 1, L0771: 1, L0521: 1, L0662: 1, L0629: 1, L0526: 1, L0368: 1, L0789: 1, L0663: 1, L0664: 1, H0519: 1, H0593: 1, H0682: 1, H0659: 1, H0670: 1, H0518: 1, H0521: 1, H0522: 1, S0176: 1, H0478: 1, L0748: 1, L0740: 1, L0750: 1, L0755: 1, L0731: 1, S0436: 1, L0608: 1, L0362: 1, S0026: 1, H0667: 1, S0242: 1 and H0543: 1.	AR061: 0, AR089: 0 L0439: 19, L0766: 10, H0521: 10, L0550: 7, L0731: 7, L0666: 6, L0748: 5, L0599: 5, S0116: 4, H0575: 4, H0617: 4, L0770: 4,
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L0774: 4, L0438: 4, L0740: 4, L0745: 4, L0747: 4, L0759: 4, L0604: 4, L0471: 3, L0769: 3, L0662: 3, L0775: 3, L0783: 3, H0435: 3, L0750: 3, L0756: 3, L0777: 3, L0752: 3, H0657: 2, H0661: 2, H0663: 2, H0486: 2, H0427: 2, H0581: 2, H0052: 2, H0032: 2, L0455: 2, S0002: 2, L0761: 2, L0776: 2, L0657: 2, L0659: 2, L0518: 2, H0520: 2, H0519: 2, H0689: 2, H0670: 2, H0522: 2, L0746: 2, L0605: 2, L0485: 2, H0667: 2, H0543: 2, H0423: 2, H0624: 1, H0170: 1, H0265: 1, H0556: 1, H0685: 1, S0218: 1, L0443: 1, S0212: 1, S0001: 1, S0348: 1, S0358: 1, S0360: 1, H0580: 1,
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[illegible]

105	HNTAR73	949289	115	2 - 376	439	Pro-11 to Ala-17, Pro-19 to Gly-27, Cys-60 to Gln-71, Arg-73 to His-83, Pro-85 to Asn-92.	AR061: 1, AR089: 1 H0549: 7, L0665: 6, L0751: 6, L0439: 5, H0620: 3, L0803: 3, L0777: 3, L0601: 3, H0483: 2, H0486: 2, H0309: 2, L0774: 2, L0657: 2, L0659: 2, L0809: 2, L0666: 2, L0438: 2, H0520: 2, H0658: 2, L0602: 2, H0555: 2, H0624: 1, H0686: 1, H0295: 1, H0656: 1, S0282: 1, H0255: 1, S0354: 1, H0580: 1, H0619: 1,	L0663: 1, H0691: 1, H0660: 1, H0648: 1, H0672: 1, S0328: 1, S0378: 1, S0044: 1, S0188: 1, H0134: 1, S3012: 1, S0390: 1, S0028: 1, L0749: 1, L0786: 1, L0779: 1, L0755: 1, L0757: 1, L0758: 1, L0608: 1, H0665: 1, H0542: 1 and S0384: 1.		
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106	HHEGC16	950778	116	1178 - 861	440				H0618: 1, H0581: 1, S0049: 1, H0052: 1, H0562: 1, H0012: 1, H0083: 1, H0687: 1, S0250: 1, H0428: 1, L0483: 1, H0135: 1, S0038: 1, H0494: 1, L0640: 1, L0638: 1, L0637: 1, L0771: 1, L0662: 1, L0805: 1, L0655: 1, L0629: 1, L0368: 1, L0789: 1, L0663: 1, H0519: 1, H0593: 1, H0682: 1, H0670: 1, H0521: 1, H0522: 1, H0696: 1, L0740: 1, L0779: 1, H0667: 1 and H0543: 1.		
107	HSIGE72	952275	117	2 - 1663	441	Glu-1 to Ser-7.			AR089: 19, AR061: 2 L0770: 2, S0126: 2, L0748: 2, L0740: 2, H0542: 2, S0420: 1, S0360: 1, H0575: 1, H0551: 1, L0766: 1, L0745: 1, L0731: 1 and H0543: 1.		

108	HCGMG56	953660	118	706 - 170	442	Gln-24 to Pro-43, Gly-68 to Lys-74.	AR089: 9, AR061: 5 H0090: 2, H0419: 1,		
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									H0483: 1, H0459: 1, S0045: 1, H0455: 1, H0642: 1, H0485: 1, H0486: 1, H0052: 1, H0239: 1, H0617: 1, T0042: 1, H0494: 1, H0641: 1, H0547: 1, S0044: 1, S0037: 1, L0742: 1, L0439: 1, L0755: 1 and H0543: 1.			
109	HNGBQ66	966001	119	252 - 1532	443	Lys-34 to Ala-42, Lys-71 to Leu-76, Arg-188 to Trp-193, Val-215 to Asn-220, Ser-269 to Gln-274, Leu-333 to Lys-341, Thr-354 to Lys-361, Thr-401 to Ile-407, Lys-419 to Arg-427.			AR089: 52, AR061: 12 H0556: 1, H0346: 1, S0358: 1, H0090: 1, T0042: 1, H0560: 1, S0052: 1, H0519: 1 and S0152: 1.			
110	HTXPY09	966013	120	312 - 617	444	Ser-9 to Asn-15, Ser-64 to Gln-69.			AR061: 1, AR089: 1 H0581: 2, H0556: 1 and H0538: 1.			
111	HCHAS12	966626	121	1 - 1209	445	Cys-1 to Arg-13, Pro-15 to Gly-21, Gly-54 to Ser-59.			AR061: 15, AR089: 4 H0617: 41, L0754: 38, L0779: 38, L0758: 32, H0618: 17, H0483: 11, S0358: 10, L0775: 10, L0777: 7, H0484: 6,			

	L0774: 6, L0776: 6, L0748: 6, L0740: 6, L0752: 6, H0253: 5, H0181: 5, T0114: 4, L0750: 4, L0780: 4, L0755: 4, H0606: 3, H0087: 3, L0769: 3, L0764: 3, L0771: 3, L0806: 3, H0295: 2, S0354: 2, H0549: 2, H0298: 2, H0590: 2, H0510: 2, H0553: 2, H0038: 2, H0494: 2, H0509: 2, L0783: 2, L0809: 2, L0789: 2, L0665: 2, S0330: 2, H0696: 2, L0747: 2, L0596: 2, H0653: 2, H0661: 1, S0376: 1, H0282: 1, H0331: 1, H0574: 1, H0575: 1, H0251: 1, H0263: 1, H0204: 1, H0596: 1, T0110: 1, H0597: 1, H0327: 1, L0719: 1, H0544: 1, H0545: 1, H0178: 1, H0620: 1, H0375: 1, H0188: 1,	
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									H0615: 1, H0622: 1, H0033: 1, H0424: 1, H0644: 1, L0640: 1, L0763: 1, L0761: 1, L0772: 1, L0800: 1, L0642: 1, L0773: 1, L0662: 1, L0767: 1, L0794: 1, L0766: 1, L0649: 1, L0525: 1, L0659: 1, L0782: 1, L0666: 1, L0663: 1, L0565: 1, H0682: 1, H0670: 1, H0521: 1, L0741: 1, L0743: 1, L0439: 1, L0786: 1, L0731: 1, L0601: 1 and H0423: 1.		
112	H6EDI12	1154053	122	3 - 557	446	Pro-30 to Ala-37, Ala-40 to Arg-49, Ala-152 to Leu-163.	AR089: 1, AR061: 0 S0294: 2, H0559: 1 and L0747: 1.				
		911587	280	1 - 549	604	Pro-28 to Ala-35, Ala-38 to Arg-47.					
113	HE8MI76	911474	123	230 - 961	447	Pro-12 to Ala-17, Asp-23 to Phe-28.	AR089: 3, AR061: 0 S0040: 2, H0547: 2, L0393: 1, H0013: 1, H0427: 1, T0110: 1, T0078: 1, S0364: 1, H0124: 1, H0551: 1.				

114	HSDGJ23	714160	124	148 - 405	448				H0100: 1, H0494: 1, H0509: 1, H0555: 1 and L0439: 1.		
									AR061: 0, AR089: 0 H0255: 1, H0305: 1, S0044: 1, S0037: 1, S0028: 1 and S0031: 1.		
115	HHSAD81	602854	125	607 - 386	449		Ser-9 to Glu-14, Arg-22 to Arg-27.		AR061: 1, AR089: 1 H0494: 2, H0544: 1, S0051: 1, L0754: 1 and H0542: 1.		
		847391	281	1781 - 1107	605		Arg-164 to Arg-169.				
		970432	282	1 - 678	606						
116	HCEEZ56	1171692	126	3 - 1346	450		Lys-10 to Arg-25, Glu-40 to Ala-46, Arg-174 to Ala-181, Ala-202 to Gln-208.		AR061: 3, AR089: 2 H0618: 3, L0439: 3, H0124: 2, L0771: 2, L0766: 2, S0126: 2, H0445: 2, H0265: 1, H0253: 1, H0318: 1, H0421: 1, H0052: 1, H0197: 1, H0015: 1, S0628: 1, H0266: 1, H0380: 1, H0529: 1, L0803: 1, H0144: 1, L0352: 1, S0328: 1, H0539: 1, S0378: 1, H0134: 1, L0749: 1, L0777: 1, L0758: 1 and		

		971572	283	3 - 1346	607	Lys-10 to Arg-25, Glu-40 to Ala-46, Arg-174 to Ala-181, Ala-202 to Gln-208.	L0595: 1.		
117	HE8TT33	1189455	127	3 - 2189	451	Leu-26 to Tyr-32, Pro-108 to Gln-123.	AR061: 6, AR089: 4 S0045: 2, S0046: 1, H0645: 1, H0013: 1, H0575: 1, H0286: 1, H0521: 1 and H0136: 1.		
		952123	284	3 - 2189	608	Leu-26 to Tyr-32, Pro-108 to Gln-123.			
118	HAGBX32	951351	128	3 - 509	452	Gly-14 to Glu-32, Pro-60 to Ala-70, Thr-145 to Gly-153, Ser-164 to Leu-169.	AR061: 4, AR089: 4 L0439: 4, L0418: 1, S0010: 1, L0455: 1, S0028: 1 and L0741: 1.	108730, 147781, 172471, 186580, 264800, 266600, 278760, 600760, 600760, 600761, 600761, 602066	
		956281	285	473 - 138	609	Phe-4 to Gly-12.			
119	HLWEE80	1202534	129	601 - 1134	453	Ser-38 to Asp-46, Leu-55 to Leu-60,	AR061: 8, AR089: 7 H0081: 2, H0549: 1,		

120	HMEFI81	1226739	130	275 - 688	610	Ser-1 to Trp-6, Ser-10 to Glu-22, Pro-112 to Ser-117.	Lys-73 to Glu-79.	H0069: 1, H0046: 1, H0428: 1, H0553: 1, H0087: 1, H0529: 1, L0532: 1, H0521: 1 and H0423: 1.		
						Gln-15 to Asn-20, Met-59 to Gln-66.		AR061: 1, AR089: 1 L0748: 11, L0749: 6, L0779: 4, L0438: 2, H0547: 2, L0747: 2, L0777: 2, L0596: 2, H0650: 1, H0013: 1, H0581: 1, H0046: 1, H0009: 1, H0266: 1, H0622: 1, T0042: 1, S0002: 1, H0695: 1, H0529: 1, L0762: 1, L0769: 1, L0771: 1, L0766: 1, L0376: 1, L0809: 1, L0666: 1, L0665: 1, H0658: 1, H0648: 1, S0044: 1, H0555: 1, H0187: 1, L0750: 1, L0752: 1, L0758: 1, H0343: 1, S0026: 1, S0192: 1,		

									S0194: 1, H0542: 1, H0543: 1 and H0423: 1.		
		574258	287	29 - 496	611	Gln-15 to Asn-20, Met-59 to Asp-64.					
121	HOUHW83	1199942	131	79 - 813	455	Thr-1 to Asp-7, Gly-37 to Asn-44, Arg-175 to Tyr-180, Lys-190 to Pro-198, Gln-204 to Leu-209.			AR089: 10, AR061: 3 H0560: 2, S0342: 1, H0586: 1, L0471: 1, H0644: 1, H0617: 1, H0040: 1, H0641: 1, H0529: 1, H0519: 1, S0037: 1 and L0757: 1.		
		882335	288	60 - 680	612	Thr-1 to Asp-7, Gly-37 to Asn-44.					
122	HSLCB60	1193050	132	835 - 284	456	Arg-58 to Glu-63, Val-80 to Gly-87, Arg-114 to Lys-119, Ala-132 to Gly-137, Val-140 to Asp-145, Ala-173 to Pro-178.			AR089: 0 S3010: 2, S0028: 1 and S0260: 1.		
		730740	289	82 - 468	613	Ala-25 to Thr-31, Glu-58 to Arg-63, Gln-82 to Arg-87.					
123	HSLFG64	1228145	133	808 - 2142	457	Arg-1 to Gly-8, His-33 to Glu-44, Ala-57 to Gly-62, Tyr-71 to Arg-77, Pro-85 to Asn-93,			AR089: 1, AR061: 1 S0028: 3, H0617: 2, S0045: 1, H0181: 1, H0383: 1 and S0144: 1.		

	853387	290	1196 - 3	614	Asp-116 to Ser-122. Arg-1 to Gly-8, His-33 to Glu-44, Ala-57 to Gly-62, Tyr-71 to Arg-77, Pro-85 to Asn-93, Asp-116 to His-121.			
124	HTPFX16	974296	134	3 - 422	458	Asp-40 to Asn-49, Cys-65 to Gly-71.	AR061: 3, AR089: 2 L0750: 2, H0024: 1, H0039: 1, H0622: 1, H0040: 1 and S0434: 1.	
125	HWAER24	934693	135	677 - 2566	459	Ser-6 to Thr-11.	AR061: 1, AR089: 0 L0748: 11, L0749: 6, L0779: 4, L0438: 2, H0547: 2, L0747: 2, L0777: 2, L0596: 2, H0650: 1, H0013: 1, H0581: 1, H0046: 1, H0009: 1, H0266: 1, H0622: 1, T0042: 1, S0002: 1, H0695: 1, H0529: 1, L0762: 1, L0769: 1, L0771: 1, L0766: 1, L0376: 1, L0809: 1, L0666: 1, L0665: 1, H0658: 1, H0648: 1, S0044: 1, H0555: 1, H0187: 1,	

126	HKMAC08	1121865	136	193 - 723	460	Phe-5 to Val-11, Ser-28 to Lys-35, His-119 to Gln-127.	AR089: 40, AR061: 37 S0015: 1 and H0665: 1.	L0750: 1, L0752: 1, L0758: 1, H0343: 1, S0026: 1, S0192: 1, S0194: 1, H0542: 1, H0543: 1 and H0423: 1.	
		960388	291	193 - 723	615	Phe-5 to Val-11, Ser-28 to Lys-35, His-119 to Gln-127.			
127	HSLHS93	1105323	137	1 - 156	461		AR089: 56, AR061: 55 S0001: 1, S0051: 1 and S0028: 1.		
		791608	292	3 - 143	616				
128	HBGOT10	963457	138	3 - 437	462	Ser-19 to Asp-32, Tyr-58 to Gly-67.	AR061: 2, AR089: 1 S0278: 1, H0031: 1, H0617: 1 and S0390: 1.		
129	HSDJW73	882817	139	358 - 2	463	Val-33 to Tyr-44.	AR089: 1, AR061: 0 H0013: 1, S0028: 1 and S0260: 1.		
		883338	293	221 - 739	617	Arg-52 to Lys-57, Glu-67 to Ile-74.			
130	HWMEQ37	949568	140	97 - 867	464	Leu-29 to Pro-47, Pro-55 to Arg-60, Pro-99 to Gly-106, Met-170 to Thr-177.	AR089: 5, AR061: 2 S0356: 1, S0354: 1, S0358: 1, S0376: 1, H0620: 1, H0023: 1.		

131	HFRBX44	1107898	141	249 - 1685	465	Glu-196 to Ser-207. Arg-6 to Gly-14, Cys-20 to Gly-27, Leu-80 to Pro-86.	H0039: 1 and H0593: 1. AR089: 1, AR061: 1 S0050: 1, H0316: 1, S0428: 1, H0694: 1 and S0031: 1.			
		860207	294	2 - 292	618	Pro-6 to Thr-15, Asp-27 to Thr-35.				
132	HRDDR74	1103362	142	2 - 646	466	Arg-8 to Arg-14.	AR061: 3, AR089: 2 H0542: 2, H0597: 1, H0288: 1, H0124: 1, H0264: 1, S0344: 1, L0752: 1 and L0581: 1.			
		531702	295	67 - 372	619	Pro-21 to Ser-27, Arg-42 to Asp-49, Arg-82 to Ser-90.				
133	HPIAQ70	1151503	143	564 - 151	467	Arg-12 to Tyr-23, Ser-31 to Pro-37, Thr-42 to Ala-56, Ile-122 to Lys-128.	AR089: 18, AR061: 9 S0150: 1			
		973604	296	185 - 436	620	Gly-36 to Thr-41.				
134	HROAZ07	973603	144	5 - 514	468		AR089: 1, AR061: 0 H0316: 1			
135	HTTER50	1220586	145	1 - 1236	469	Pro-1 to Gly-6, Ile-40 to Lys-46.	AR061: 3, AR089: 2 L0748: 12, L0749: 7, L0766: 5, L0803: 4, L0756: 4, L0769: 3, L0666: 3, H0547: 3,			

136	HUFBV44	1220585	146	3 - 338	470	621	Gln-13 to Leu-20, Ala-23 to Leu-29, Lys-58 to Tyr-69.	L0777: 3, H0543: 3, S0036: 2, H0040: 2, H0059: 2, L0659: 2, L0790: 2, L0439: 2, H0295: 1, H0657: 1, H0341: 1, S0282: 1, H0228: 1, H0589: 1, S0360: 1, H0431: 1, H0370: 1, H0013: 1, H0156: 1, H0590: 1, H0052: 1, H0051: 1, H0083: 1, S6028: 1, H0188: 1, T0041: 1, H0560: 1, L0643: 1, L0662: 1, L0805: 1, L0776: 1, L0663: 1, H0144: 1, S0328: 1, L0741: 1, L0740: 1, L0751: 1, L0747: 1, L0755: 1, L0758: 1, S0031: 1, H0422: 1 and H0506: 1.	AR089: 2, AR061: 1 L0748: 12, L0749: 7, L0766: 5, L0803: 4.
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									L0756: 4, L0769: 3, L0666: 3, H0547: 3, L0777: 3, H0543: 3, S0036: 2, H0040: 2, H0059: 2, L0659: 2, L0790: 2, L0439: 2, H0295: 1, H0657: 1, H0341: 1, S0282: 1, H0228: 1, H0589: 1, S0360: 1, H0431: 1, H0370: 1, H0013: 1, H0156: 1, H0590: 1, H0052: 1, H0051: 1, H0083: 1, S6028: 1, H0188: 1, T0041: 1, H0560: 1, L0643: 1, L0662: 1, L0805: 1, L0776: 1, L0663: 1, H0144: 1, S0328: 1, L0741: 1, L0740: 1, L0751: 1, L0747: 1, L0755: 1, L0758: 1, S0031: 1, H0422: 1 and H0506: 1.		
									AR061: 2, AR089: 2 H0170: 2 and S0050: 1.		
137	HE2EI69	851306	298	1 - 336	622	Thr-16 to Lys-25.					
		534587	147	307 - 14	471						
138	HWMJR63	1152429	148	3 - 1004	472	Thr-1 to Ile-12,			AR089: 1, AR061: 1		

Pro-78 to Lys-86, Cys-88 to Leu-97, Asp-100 to Ile-107, Pro-176 to Pro-181, Arg-191 to Met-196, Pro-200 to Arg-210, Pro-246 to Ala-259, Ser-271 to Glu-276, Asp-298 to Trp-306.	H0599: 25, L0731: 19, L0750: 14, L0754: 13, L0766: 8, L0776: 8, L0752: 8, L0757: 8, L0747: 6, L0744: 5, L0769: 4, L0779: 4, L0777: 4, S0420: 3, L0770: 3, L0755: 3, L0758: 3, L0471: 2, L0771: 2, L0775: 2, L0806: 2, L0659: 2, S0126: 2, H0670: 2, L0743: 2, L0759: 2, L0604: 2, H0624: 1, H0685: 1, H0650: 1, H0484: 1, H0483: 1, H0661: 1, S0358: 1, S0360: 1, S0046: 1, H0411: 1, H0632: 1, H0427: 1, S0280: 1, H0097: 1, H0004: 1, S0049: 1, H0028: 1, H0622: 1, L0142: 1, H0591: 1, L0763: 1, L0772: 1, L0800: 1, L0764: 1, L0662: 1, L0768: 1, L0794: 1, L0774: 1, L0807: 1,
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									L0809: 1, L0666: 1, L0665: 1, S0148: 1, S0328: 1, S0406: 1, S3014: 1, S0027: 1, S0028: 1, L0599: 1, S0026: 1 and H0667: 1.		
139	HSLFD83	667155	149	18 - 365	473	623	299	2 - 1036	Pro-1 to Pro-6, Pro-77 to Lys-85, Cys-87 to Leu-96, Asp-99 to Ile-106, Pro-175 to Pro-180, Arg-190 to Met-195, Pro-199 to Arg-209, Pro-245 to Ala-258, Ser-270 to Glu-275, Asp-297 to Trp-305, Gly-334 to Ser-339.		
140	HBKDA90	912285	150	818 - 531	474				Val-11 to Ile-16, Gly-98 to Pro-103. Ser-24 to Ser-29.	AR089: 33, AR061: 10 S0028: 2 and H0178: 1. AR089: 3, AR061: 1 L0604: 12, S0366: 7, L0485: 5, H0599: 4, L0777: 4, H0196: 3, H0373: 3, L0520: 3, L0623: 2, S0330: 2, H0486: 1, H0013: 1, H0002: 1, H0253: 1, H0318: 1, L0163: 1,	

141	HTLAA37	952737	300	292 - 1932	624	Asp-27 to His-32, Gln-65 to Gly-76, Lys-80 to Ser-94, Pro-99 to Asn-104, Gly-126 to Lys-143, Pro-150 to Lys-156, Glu-163 to Glu-175, Val-193 to Asp-204, Met-230 to Ser-263, Ala-278 to Gly-291, Pro-306 to Asn-320, Asn-328 to Lys-333, Glu-348 to Glu-355, Ile-358 to Asn-363, Glu-375 to Ser-381, Lys-390 to Arg-395, Lys-433 to Asn-441, Ser-456 to Phe-463, Glu-484 to Lys-490, Glu-498 to Gly-507, Glu-535 to Glu-547.	S0364: 1, H0616: 1, H0561: 1 and L0584: 1.		
		956567 754641	301 151	506 - 141 2 - 316	625 475				
							AR089: 27, AR061: 12 L0761: 4, H0677: 4, H0556: 3, H0661: 3, H0617: 3, H0580: 2,		

142	HTRAA36	756908	152	220 - 714	476				H0253: 2, H0135: 2, H0090: 2, L0509: 2, L0657: 2, L0438: 2, S0152: 2, H0436: 2, H0265: 1, H0161: 1, H0656: 1, S0420: 1, S0360: 1, H0550: 1, H0614: 1, H0250: 1, H0618: 1, H0544: 1, H0050: 1, T0010: 1, H0356: 1, H0252: 1, H0428: 1, H0040: 1, L0351: 1, S0344: 1, S0426: 1, L0499: 1, L0375: 1, L0776: 1, L0634: 1, L0809: 1, L0665: 1, H0144: 1, H0547: 1, H0658: 1, S0037: 1, L0744: 1, L0749: 1, L0777: 1, H0595: 1, L0366: 1, H0543: 1, H0422: 1 and H0506: 1.			
									AR061: 2, AR089: 1 S0045: 1, S0036: 1, H0164: 1 and H0026: 1.			
		827518	302	3 - 530	626	Arg-21 to Asp-28, Thr-36 to Val-43.						


143	HRGDD16	877117	153	3 - 293	477	Asn-95 to Ser-100. His-1 to Asp-6, Pro-63 to Leu-74.	AR089: 11, AR061: 4 H0550: 1, S0366: 1 and H0134: 1.		
144	HNSAB28	881286	154	2 - 838	478	Asp-1 to Lys-7, Gly-27 to Gln-32, Arg-67 to Gly-77.	AR089: 6, AR061: 1 H0478: 3, S0278: 2, L0731: 2, S0001: 1, S0360: 1, S0132: 1, H0619: 1, H0263: 1, S0036: 1, H0040: 1, H0494: 1, S0142: 1, S0344: 1, L0764: 1, L0766: 1, S3014: 1, L0748: 1, H0445: 1 and S0434: 1.	12q13	107777, 123940, 139350, 139350, 148040, 148041, 148043, 148070, 231550, 600194, 600231, 600536, 600808, 600956, 601284, 601769, 601769, 601928, 602116, 602153
145	HTTEP70	917729	155	46 - 858	479	Asn-60 to Gln-74, Pro-97 to Arg-103, Pro-128 to Gln-134, Ser-141 to Glu-154.	AR061: 6, AR089: 3 H0623: 3, H0620: 2, H0521: 2, H0542: 2, H0556: 1, H0341: 1.		

146	HMSII43	946985	156	56 - 517	480	Ala-157 to Arg-163.	H0411: 1, H0261: 1, H0586: 1, H0575: 1, H0581: 1, T0010: 1, L0142: 1, H0040: 1, H0634: 1, H0560: 1, S0426: 1, L0774: 1, H0520: 1, S0126: 1, H0670: 1, S0390: 1, L0593: 1, H0136: 1, H0543: 1, H0423: 1, H0422: 1 and H0677: 1.		
						Asn-18 to Gly-25, Lys-33 to Ser-43, His-54 to Cys-63, Ser-71 to Gly-76, Ser-85 to Gln-93.	AR089: 2, AR061: 1 L0731: 17, L0777: 16, L0748: 12, L0751: 10, H0620: 9, L0770: 8, S0002: 7, L0769: 7, L0665: 7, L0747: 6, L0759: 6, H0457: 5, H0012: 4, L0779: 4, S0358: 3, H0050: 3, H0641: 3, L0438: 3, H0225: 2, S0212: 2, H0255: 2, H0638: 2, S0007: 2, H0645: 2, S0278: 2, H0581: 2, H0023: 2, H0051: 2, H0266: 2, S0144: 2, L0667: 2, L0783: 2,		

	S0052: 2, L0740: 2, L0755: 2, H0423: 2, H0294: 1, S0114: 1, H0657: 1, S0110: 1, S0282: 1, S0418: 1, S0360: 1, S0046: 1, H0608: 1, H0613: 1, H0486: 1, H0575: 1, H0590: 1, H0253: 1, H0421: 1, S0324: 1, H0007: 1, H0052: 1, H0309: 1, H0546: 1, H0009: 1, H0123: 1, L0471: 1, S0051: 1, H0083: 1, H0354: 1, H0375: 1, H0188: 1, H0553: 1, H0628: 1, H0673: 1, H0598: 1, H0040: 1, H0063: 1, H0551: 1, H0058: 1, H0264: 1, H0100: 1, H0561: 1, H0647: 1, S0210: 1, S0426: 1, L0763: 1, L0631: 1, L0761: 1, L0772: 1, L0644: 1, L0771: 1, L0794: 1, L0766: 1, L0803: 1, L0375: 1,	
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147	HMAADV11	920770	157	21 - 428	481			L0805: 1, L0657: 1, L0659: 1, L0782: 1, L0809: 1, L0790: 1, L0663: 1, L0664: 1, S0428: 1, S0053: 1, S0374: 1, H0547: 1, H0684: 1, H0660: 1, S0330: 1, H0521: 1, S0037: 1, S0206: 1, L0439: 1, H0445: 1, L0599: 1, H0543: 1 and L0462: 1.		
148	HNTCK35	1226201	158	1 - 1842	482	Asp-1 to Gly-9, Arg-62 to Asp-68.		AR061: 60, AR089: 22 S0050: 1, H0271: 1 and S0144: 1.		
149	HTPGQ16	966597	303	1 - 366	627			AR061: 0, AR089: 0 H0519: 1 and H0521: 1.		
		1027781	159	3 - 806	483	His-1 to Lys-6, His-75 to Phe-84, Asp-91 to Phe-96, Pro-99 to Phe-110, Tyr-158 to Trp-164, Pro-169 to Ser-177, Gly-185 to Ala-207.		AR061: 9, AR089: 4 H0624: 1, H0622: 1, H0539: 1 and L0581: 1.		
		909618	304	145 - 843	628	His-62 to Phe-71, Asp-78 to Phe-83,				

150	HOCMS18	1227594	160	1 - 1029	484	<p>Pro-86 to Phe-97, Tyr-145 to Thr-150, Lys-180 to Ala-193.</p> <p>Ala-1 to Ser-11, Pro-52 to Gly-61, Thr-68 to Gly-103, Lys-114 to Ala-120, Pro-122 to Arg-127, Gly-136 to Thr-147, Asn-150 to Arg-167, Lys-186 to Gln-193, Ser-195 to His-200, Ser-208 to Glu-215, Tyr-234 to Thr-242.</p>	<p>AR089: 2, AR061: 0 L0777: 14, L0740: 9, H0050: 5, L0599: 5, L0747: 4, L0759: 4, S0040: 3, H0599: 3, H0031: 3, L0770: 3, L0803: 3, L0647: 3, S0328: 3, S3014: 3, S0206: 3, L0756: 3, L0779: 3, L0731: 3, L0758: 3, S0116: 2, S0360: 2, H0619: 2, H0575: 2, H0251: 2, H0545: 2, H0266: 2, H0135: 2, H0040: 2, H0551: 2, H0059: 2, L0764: 2, L0776: 2, L0659: 2, H0144: 2, H0547: 2, S0037: 2, L0744: 2, L0749: 2, H0506: 2, H0295: 1, S0212: 1, S0418: 1, S0007: 1, S0046: 1, H0645: 1, S0222: 1, L0468: 1, H0333: 1,</p>		
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									L0757: 1, S0031: 1, L0584: 1, L0591: 1, L0361: 1, L0603: 1, S0194: 1, L0600: 1 and H0352: 1.			
	961424	305	1 - 1443	629	Gln-2 to Ser-11, Pro-52 to Gly-61, Thr-68 to Gly-103, Lys-114 to Ala-120, Pro-122 to Arg-127, Gly-136 to Thr-147, Asn-150 to Arg-167.							
151	HE8AM58	1204936	161	1 - 954	485	Gly-1 to Ser-11, Ser-18 to Ala-25, Ser-70 to Cys-77, Asp-89 to His-104.			AR061: 424, AR089: 326 H0370: 1, H0013: 1 and S0330: 1.			
	894346	306	2 - 460	630	Ser-65 to Cys-72, Asp-84 to His-99, Arg-107 to Asn-112.							
152	HUSGZ51	955542	162	3 - 356	486	Ile-45 to Arg-52, Phe-77 to Pro-85.			AR089: 11, AR061: 5 H0556: 10, L0748: 8, H0620: 7, L0747: 7, H0265: 5, L0637: 5, H0013: 4, H0551: 4, L0776: 4, L0663: 4, L0596: 4, H0622: 3, H0617: 3, L0772: 3, L0766: 3, S0126: 3,			

	L0751: 3, L0752: 3, L0757: 3, S0031: 3, L0593: 3, H0657: 2, S0360: 2, S0222: 2, T0115: 2, H0009: 2, L0471: 2, H0594: 2, H0288: 2, H0039: 2, H0424: 2, H0135: 2, H0040: 2, H0623: 2, L0763: 2, L0769: 2, L0796: 2, L0804: 2, L0775: 2, L0634: 2, L0666: 2, L0438: 2, L0756: 2, H0445: 2, L0595: 2, H0542: 2, H0423: 2, H0422: 2, T0002: 1, S0114: 1, S0218: 1, H0661: 1, S0358: 1, S0007: 1, S0046: 1, S0132: 1, S0278: 1, H0431: 1, H0370: 1, H0586: 1, H0632: 1, H0486: 1, T0040: 1, S0280: 1, H0318: 1, H0581: 1, H0085: 1, T0110: 1, H0545: 1, H0081: 1, S0362: 1, H0247: 1,						
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					H0266: 1, H0290: 1, H0292: 1, H0286: 1, S0340: 1, S0036: 1, H0090: 1, H0591: 1, H0038: 1, H0616: 1, H0433: 1, H0412: 1, S0038: 1, H0494: 1, H0561: 1, S0352: 1, S0144: 1, S0142: 1, L0369: 1, L0761: 1, L0372: 1, L0646: 1, L0374: 1, L0764: 1, L0771: 1, L0773: 1, L0381: 1, L0388: 1, L0774: 1, L0651: 1, L0378: 1, L0657: 1, L0658: 1, L0383: 1, L0665: 1, L0352: 1, H0593: 1, H0689: 1, H0682: 1, H0660: 1, S0328: 1, S0152: 1, H0696: 1, S0044: 1, S0037: 1, S3014: 1, S0206: 1, L0439: 1, L0754: 1, L0749: 1, L0750: 1, L0731: 1, L0759: 1, L0588: 1, L0362: 1, L0361: 1,				
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153	HELEQ48	960866	163	48 - 500	487				H0653: 1, H0136: 1, S0196: 1, H0543: 1 and S0424: 1.		
									AR089: 1, AR061: 0 H0424: 5, S0045: 1, H0051: 1, S0051: 1, H0213: 1, H0616: 1, H0079: 1, L0639: 1, L0662: 1, L0794: 1, L0803: 1, L0804: 1, L0774: 1, L0805: 1, L0659: 1, L0789: 1 and L0742: 1.		
154	HOF0E03	1226251	164	2117 - 3	488	Gln-14 to Pro-21, Ala-46 to Trp-51, Ala-79 to Thr-86, Lys-179 to Thr-185, Asn-210 to Gly-216, Asn-243 to Gly-249, Met-278 to Pro-286.			AR089: 1, AR061: 0 H0415: 1, H0575: 1, H0560: 1 and H0561: 1.		
		911616	307	127 - 840	631						
155	HNFFR23	585289	165	3 - 335	489				AR089: 0, AR061: 0 H0271: 1 and S0044: 1.		
156	HOGCC57	1205511	166	95 - 754	490	Ala-15 to Arg-31, Ala-55 to Gly-62, Glu-122 to Gly-128, His-150 to Asn-155, Val-187 to Arg-195.			AR089: 2, AR061: 1 L0748: 2, H0622: 1, H0551: 1, L0774: 1, L0776: 1, H0435: 1 and L0751: 1.		

157	HFOZC96	926685	167	1 - 309	491	Ala-15 to Arg-31, Ala-55 to Gly-62, Glu-122 to Gly-128, His-150 to Asn-155, Val-187 to Arg-195. Pro-1 to Gly-7, Gln-52 to Cys-61, His-88 to Tyr-93.	AR089: 1, AR061: 1 L0766: 6, L0748: 3, L0779: 3, S0360: 2, H0545: 2, H0494: 2, L0769: 2, L0731: 2, L0759: 2, L0599: 2, H0295: 1, L0622: 1, L0021: 1, H0052: 1, H0546: 1, H0457: 1, H0086: 1, H0123: 1, H0413: 1, L0646: 1, L0768: 1, L0381: 1, L0659: 1, L0783: 1, L0809: 1, L0790: 1, L0666: 1, L0663: 1, H0539: 1, S0102: 1, L0747: 1, S0276: 1, H0543: 1 and H0352: 1.		
158	HOHBK44	823872	168	3 - 527	492	Ser-1 to Arg-6, Arg-37 to Thr-43.	AR089: 1, AR061: 1 L0740: 11, L0662: 4, L0756: 4, L0777: 4, L0758: 4, L0649: 3, L0666: 3, L0748: 3,		

		H0542: 3, S0412: 3, H0171: 2, S0001: 2, S0356: 2, S0360: 2, H0580: 2, H0014: 2, H0038: 2, H0040: 2, S0002: 2, L0809: 2, L0665: 2, H0144: 2, H0547: 2, L0602: 2, L0746: 2, L0747: 2, L0731: 2, H0624: 1, S0040: 1, L0174: 1, H0661: 1, S0468: 1, S0046: 1, H0333: 1, H0427: 1, S0474: 1, H0581: 1, H0052: 1, H0687: 1, S0250: 1, H0328: 1, H0615: 1, H0553: 1, H0628: 1, S0364: 1, H0056: 1, L0564: 1, H0625: 1, H0652: 1, S0422: 1, L0598: 1, L0640: 1, L0763: 1, L0646: 1, L0794: 1, L0803: 1, L0375: 1, L0805: 1, L0776: 1, L0657: 1, L0659: 1, L0783: 1, L0791: 1, L0532: 1,
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									L0663: 1, L0565: 1, H0519: 1, H0670: 1, H0436: 1, H0478: 1, L0749: 1, L0779: 1, L0752: 1, L0755: 1, L0757: 1, H0445: 1, S0011: 1, H0668: 1, H0667: 1, S0276: 1 and S0398: 1.			
159	HHERB37	708477	169	3 - 320	493	Pro-1 to Pro-8, Phe-12 to Thr-17, Lys-60 to Gly-66, Lys-71 to Gly-77, Pro-88 to Gln-97.			AR089: 2, AR061: 1 L0438: 4, L0471: 2, L0439: 2, L0731: 2, H0149: 1, S0040: 1, H0438: 1, L0623: 1, H0156: 1, T0010: 1, H0424: 1, L0774: 1, L0657: 1, L0750: 1, L0777: 1, L0592: 1 and H0543: 1.			
160	HEGAW40	710652	170	69 - 686	494	Pro-8 to Trp-15, Gly-42 to Gly-51, Thr-58 to Arg-69.			AR061: 1, AR089: 0 L0766: 6, L0747: 3, L0803: 2, L0777: 2, H0550: 1, H0013: 1, L0773: 1, L0805: 1, L0809: 1, L0789: 1 and L0740: 1.			
161	HDTDQ51	1152264	171	151 - 699	495	Lys-32 to Asp-37, Pro-116 to Glu-132.			AR061: 2, AR089: 1 L0766: 3, L0764: 2,			

									L0771: 2, L0439: 2, L0756: 2, L0731: 2, S0192: 2, S0134: 1, H0415: 1, H0486: 1, H0057: 1, T0006: 1, H0031: 1, L0598: 1, L0800: 1, L0768: 1, L0794: 1, L0774: 1, L0783: 1, L0519: 1, L0663: 1, L0664: 1, L0352: 1, H0522: 1, L0748: 1, L0747: 1 and L0749: 1.		
		823871	309	140 - 598	633	Lys-32 to Asp-37, Pro-116 to Pro-137.			AR089: 1, AR061: 1 S0250: 2, H0556: 1 and H0561: 1.		
162	HOHCG42	1152272	172	3 - 488	496	Tyr-8 to Asn-13, Arg-62 to Arg-67, Lys-95 to Thr-102.					
		887839	310	143 - 409	634	Arg-15 to Arg-27.			AR089: 9, AR061: 4 L0439: 21, L0438: 5, L0758: 3, H0520: 2, L0747: 2, L0756: 2, L0777: 2, H0171: 1, S0420: 1, S0007: 1, H0024: 1, H0373: 1, L0163: 1, S0003: 1, H0428: 1, L0762: 1,		
163	HOVCC60	718918	173	2 - 604	497						

164	HMVAC92	731732	174	2.-466	498		L0805: 1, L0666: 1, H0547: 1, L0752: 1 and L0753: 1. AR089: 12, AR061: 2 Xp11.4- p11.1	300047, 300062, 300600, 309470, 309500, 309610, 310500, 310600, 310600, 311050, 312060	
165	HWGAF89	742053	175	86 - 661	499	Ala-33 to Ser-41, Ser-57 to Asp-65, Asp-77 to Asn-85, Ser-99 to Gln-109.	AR089: 4, AR061: 1 L0439: 10, L0803: 7, L0663: 6, H0423: 5, L0655: 4, L0740: 4, S0222: 3, L0649: 3, L0759: 3, H0553: 2, L0766: 2, L0438: 2, H0520: 2, S0330: 2, L0751: 2, L0746: 2, L0747: 2, H0170: 1, H0686: 1, H0650: 1, H0657: 1, S0116: 1, H0341: 1, S0356: 1, S0408: 1, S0410: 1,		

166	HHBEG78	969106	176	73 - 456	500	Ser-73 to His-81, His-83 to Thr-89.	H0393: 1, H0586: 1, T0060: 1, H0156: 1, L0105: 1, H0457: 1, H0024: 1, H0014: 1, S0388: 1, S0051: 1, T0010: 1, S0003: 1, H0428: 1, H0064: 1, H0068: 1, S0036: 1, H0090: 1, H0625: 1, S0370: 1, H0654: 1, L0638: 1, L0373: 1, L0646: 1, L0764: 1, L0765: 1, L0773: 1, L0662: 1, L0794: 1, L0806: 1, L0805: 1, L0661: 1, L0657: 1, L0659: 1, L0664: 1, L0665: 1, H0547: 1, H0696: 1, L0777: 1, L0780: 1, L0731: 1, L0758: 1, H0445: 1, S0434: 1 and S0192: 1.		
							AR089: 1, AR061: 1, S0358: 12, H0659: 8, H0657: 7, H0624: 6, S0360: 6, H0373: 6, L0588: 6, H0543: 6, L0769: 5, L0747: 5,		

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				H0484: 1, H0662: 1, H0638: 1, S0356: 1, S0354: 1, S0278: 1, S0222: 1, H0392: 1, H0586: 1, L0623: 1, T0040: 1, T0060: 1, T0114: 1, S0280: 1, H0575: 1, H0037: 1, H0318: 1, H0434: 1, H0085: 1, H0204: 1, T0115: 1, H0327: 1, H0546: 1, H0150: 1, H0071: 1, H0266: 1, S0003: 1, S0214: 1, H0644: 1, H0628: 1, L0055: 1, H0708: 1, S0036: 1, H0591: 1, H0040: 1, H0634: 1, H0551: 1, H0494: 1, S0016: 1, H0396: 1, S0438: 1, S0344: 1, S0210: 1, L0520: 1, L0761: 1, L0646: 1, L0764: 1, L0773: 1, L0768: 1, L0522: 1, L0651: 1, L0657: 1, L0659: 1, L0526: 1, L0518: 1, L0383: 1,			
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167	HPMJT61	1152422	177	195 - 515	501	Glu-1 to Ala-7, Pro-9 to Leu-28, Glu-36 to Met-52, Pro-76 to Cys-90, Ser-98 to Pro-107.	S0374: 1, H0547: 1, H0684: 1, H0666: 1, H0648: 1, H0518: 1, H0214: 1, S3012: 1, S3014: 1, S0027: 1, S0028: 1, L0746: 1, L0749: 1, L0756: 1, L0779: 1, L0780: 1, L0755: 1, S0031: 1, H0444: 1, H0445: 1, L0605: 1, L0485: 1, H0216: 1, S0192: 1, S0194: 1 and S0460: 1.		
		950367	311	1 - 585	635	Pro-19 to Ala-25, Ser-62 to Gly-68, Pro-97 to Leu-116, Glu-124 to Met-140, Pro-164 to Lys-181; Ser-186 to His-192.	AR061: 6, AR089: 3, L0748: 4, L0809: 3, L0439: 3, L0777: 2, L0589: 2, S0278: 1, H0024: 1, H0644: 1, L0791: 1, H0547: 1, L0749: 1 and H0352: 1.		
168	HKAED89	827573	178	1 - 540	502		AR089: 2, AR061: 1, L0748: 395, H0510:		

[illegible]

					H0581: 2, H0085: 2, H0263: 2, H0597: 2, H0198: 2, H0375: 2, H0271: 2, S0312: 2, H0622: 2, H0181: 2, H0400: 2, H0090: 2, H0155: 2, L0773: 2, L0375: 2, L0776: 2, S0428: 2, L0602: 2, H0518: 2, L0751: 2, L0759: 2, L0587: 2, H0506: 2, H0170: 1, H0556: 1, L0785: 1, S0354: 1, S0410: 1, H0489: 1, H0152: 1, H0208: 1, H0249: 1, H0632: 1, H0486: 1, H0101: 1, H0069: 1, H0098: 1, H0042: 1, H0004: 1, H0235: 1, H0457: 1, H0150: 1, H0178: 1, H0123: 1, H0050: 1, H0047: 1, H0416: 1, S0314: 1, T0023: 1, H0119: 1, H0606: 1, H0169: 1, S0364: 1, H0591: 1, H0038: 1, H0040: 1,
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							H0058: 1, H0059: 1, H0494: 1, S0426: 1, L0372: 1, L0771: 1, L0774: 1, L0524: 1, L0525: 1, L0805: 1, L0789: 1, L0790: 1, L0532: 1, L0665: 1, S0044: 1, S0146: 1, H0555: 1, L0743: 1, H0445: 1, H0595: 1 and S0242: 1.				
169	HHAMA35	850272	179	90 - 866	503		AR089: 8, AR061: 3 H0038: 5, H0616: 3, S0126: 3, S0280: 2, H0644: 2, H0529: 2, H0519: 2, L0779: 2, L0759: 2, H0656: 1, T0008: 1, S0046: 1, S0140: 1, H0411: 1, S0222: 1, H0427: 1, H0596: 1, H0083: 1, S6028: 1, H0030: 1, H0032: 1, H0551: 1, H0413: 1, H0494: 1, H0130: 1, H0633: 1, S0422: 1, S0002: 1, L0800: 1, L0766: 1, H0693: 1, H0520: 1,				

170	HRADJ08	1179715	180	193 - 1059	504	His-116 to Gly-121, His-220 to Gly-226.	<p>H0593: 1, H0670: 1, H0651: 1, S0176: 1, S0027: 1, L0749: 1, L0750: 1, L0604: 1, S0192: 1, S0194: 1 and S0196: 1.</p> <p>AR089: 4, AR061: 2 L0803: 6, L0742: 5, L0809: 3, L0748: 3, L0749: 3, H0599: 2, L0766: 2, L0666: 2, L0665: 2, L0439: 2, L0756: 2, L0753: 2, L0588: 2, S0282: 1, S0356: 1, S0354: 1, S0358: 1, S0360: 1, S0222: 1, H0643: 1, H0331: 1, T0039: 1, H0013: 1, S0049: 1, H0014: 1, L0163: 1, S0388: 1, S0051: 1, H0622: 1, H0163: 1, H0059: 1, L0435: 1, L0520: 1, L0770: 1, L0761: 1, L0772: 1, L0643: 1, L0764: 1, L0767: 1, L0804: 1, L0775: 1, L0805: 1,</p>		
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									L0657: 1, L0659: 1, L0790: 1, L0663: 1, L0438: 1, H0689: 1, H0648: 1, H0555: 1, L0751: 1, L0779: 1, L0777: 1, L0758: 1, L0759: 1 and S0031: 1.			
		958556	312	182 - 724	636	His-116 to Gly-121.				11q23.2	261640, 602574, 602574	
171	HLYAN64	867366	181	603 - 1442	505	Pro-5 to Arg-11, Pro-25 to Gly-30, Leu-200 to Ala-217, Ser-228 to Ser-233, Trp-252 to Ser-259.			AR089: 7, AR061: 5, H0046: 16, L0439: 5, L0493: 4, H0265: 2, L0764: 2, L0741: 2, H0170: 1, L0562: 1, H0675: 1, H0587: 1, H0618: 1, H0009: 1, H0620: 1, H0099: 1, H0039: 1, H0213: 1, H0100: 1, H0561: 1, S0344: 1, L0369: 1, L0768: 1, L0499: 1, L0375: 1, L0513: 1, L0659: 1, L0783: 1, L0382: 1, L0809: 1, L0791: 1, L0666: 1, L0747: 1, L0750: 1, H0445: 1, L0592: 1, H0543: 1 and H0352: 1.			
172	HTLHP64	883120	182	125 - 445	506	Ile-36 to Arg-41,			AR061: 2, AR089: 1			

173	HNTCI60	890754	183	2 - 808	507		Gly-69 to Lys-82.	L0764: 4, L0777: 4, H0618: 3, H0251: 3, S0358: 2, H0253: 2, H0052: 2, H0617: 2, L0743: 2, H0657: 1, H0255: 1, H0661: 1, H0662: 1, H0402: 1, H0638: 1, S0354: 1, L0622: 1, H0546: 1, S0628: 1, H0213: 1, L0772: 1, L0775: 1, L0657: 1, L0659: 1, L0809: 1, L0666: 1, S0330: 1, S0378: 1, H0696: 1, S0404: 1, H0478: 1, L0744: 1, L0750: 1, L0753: 1, L0731: 1 and H0445: 1.		
								AR089: 1, AR061: 1 L0747: 12, L0766: 10, H0683: 9, L0776: 7, H0521: 6, L0764: 4, L0439: 4, L0750: 4, L0731: 4, H0624: 3, S0222: 3, H0457: 3, H0051: 3, L0770: 3, L0769: 3, L0790: 3, L0666: 3, L0664: 3.		

					H0547: 3, L0757: 3, L0759: 3, H0050: 2, H0622: 2, H0056: 2, S0210: 2, L0662: 2, L0774: 2, L0519: 2, L0665: 2, H0519: 2, L0748: 2, L0751: 2, S0242: 2, H0556: 1, H0657: 1, H0341: 1, H0484: 1, H0125: 1, S0418: 1, S0354: 1, S0300: 1, S0278: 1, H0370: 1, H0392: 1, H0438: 1, H0600: 1, H0592: 1, T0039: 1, H0250: 1, H0427: 1, H0042: 1, H0575: 1, H0004: 1, H0421: 1, H0012: 1, H0083: 1, H0408: 1, H0355: 1, H0266: 1, H0271: 1, H0169: 1, H0135: 1, H0264: 1, H0272: 1, H0488: 1, H0412: 1, H0623: 1, H0059: 1, H0625: 1, H0641: 1, S0426: 1, L0761: 1, L0646: 1, L0773: 1,
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									L0803: 1, L0657: 1, L0659: 1, L0663: 1, S0428: 1, H0701: 1, S0148: 1, L0438: 1, H0520: 1, H0659: 1, H0648: 1, H0672: 1, S0328: 1, S0380: 1, H0627: 1, H0631: 1, S0028: 1, L0744: 1, L0754: 1, L0756: 1, L0779: 1, L0752: 1, S0434: 1, L0605: 1, L0485: 1, H0136: 1, S0192: 1, H0543: 1, H0422: 1 and S0412: 1.			
174	HUCMU74	899751	184	1 - 705	508	Pro-18 to His-34, Ser-86 to Arg-91, Gln-145 to Thr-150, Thr-165 to Ser-172, Glu-178 to Pro-184.	AR089: 6, AR061: 4 S0420: 1					
175	HWWT02	908017	185	441 - 827	509	Ser-27 to Gln-40, Asp-102 to Lys-109.	AR089: 6, AR061: 4 H0650: 1, H0657: 1, H0271: 1, S0003: 1, L0748: 1 and L0747: 1.					
176	HSKDU47	1154797	186	2 - 580	510	Leu-59 to Trp-65, Trp-91 to Pro-101, Cys-121 to Cys-131.	AR089: 14, AR061: 6 L0649: 2, S0332: 1, S0027: 1, L0593: 1 and H0543: 1.					

177	HODFI03	918008	187	551 - 1279	511	637	Leu-56 to Trp-62, Trp-88 to Pro-98, Cys-118 to Cys-128, Lys-207 to Thr-213, Ile-224 to Ser-233, Gly-254 to Ile-261, Gln-268 to Asp-274.	AR089: 31, AR061: 4 L0766: 4, L0745: 4, S0222: 3, L0662: 3, L0803: 3, H0013: 2, H0581: 2, H0090: 2, L0774: 2, H0144: 2, L0608: 2, T0002: 1, H0657: 1, H0619: 1, H0411: 1, H0592: 1, H0587: 1, H0486: 1, H0052: 1, T0010: 1, H0375: 1, H0594: 1, S0228: 1, S0250: 1, S0214: 1, H0328: 1, H0615: 1, L0483: 1, L0055: 1, H0124: 1, H0038: 1, H0040: 1, H0487: 1, H0412: 1, T0041: 1, L0646: 1, L0648: 1, L0767: 1, L0649: 1, L0659: 1,		
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178	HWHR02	919169	188	3 - 671	512				L0666: 1, H0519: 1, H0682: 1, H0659: 1, H0521: 1, L0744: 1, L0746: 1, L0756: 1, L0753: 1, L0731: 1, L0759: 1, H0653: 1, H0667: 1, S0194: 1, S0196: 1 and H0422: 1. AR061: 6, AR089: 2 L0770: 4, L0771: 4, L0769: 3, L0757: 3, L0766: 2, L0779: 2, L0758: 2, H0170: 1, H0686: 1, H0586: 1, L0637: 1, L0761: 1, L0803: 1, L0774: 1, L0776: 1, L0659: 1, L0809: 1, L0791: 1, H0658: 1, H0696: 1, S3012: 1, S0390: 1, L0747: 1, L0752: 1, L0753: 1, L0759: 1, L0592: 1 and H0543: 1.	7q22		126650, 126650, 154276, 173360, 173360, 602136, 602136, 602136, 602447
179	HSVBQ03	924850	189	352 - 101	513				AR089: 3, AR061: 3 L0747: 6, L0748: 2, L0755: 2, S0040: 1, H0392: 1, H0587: 1, H0575: 1, H0251: 1.			

180	HSLCQ10	1153914	190	2 - 352	514	Arg-8 to Thr-13, Gly-58 to Asp-63, Pro-71 to Ala-78, Val-80 to Thr-86.	H0309: 1, H0597: 1, H0041: 1, L0471: 1, H0024: 1, H0687: 1, S0366: 1, H0163: 1, S0142: 1, S0210: 1, L0640: 1, L0764: 1, L0662: 1, L0774: 1, L0659: 1, L0665: 1, S0052: 1, L0565: 1, S0380: 1, S0037: 1, L0779: 1, L0757: 1, H0595: 1, H0668: 1 and S0194: 1.		
							AR061: 3, AR089: 3 H0521: 3, H0619: 2, L0471: 2, H0341: 1, S0046: 1, H0645: 1, H0587: 1, H0486: 1, H0052: 1, H0457: 1, H0050: 1, H0266: 1, S0003: 1, H0622: 1, L0659: 1, H0520: 1, H0539: 1, S0152: 1, S0028: 1, L0740: 1, L0754: 1, L0592: 1, H0665: 1, H0667: 1 and H0543: 1.		
		963625	314	588 - 1376	638	Thr-48 to His-54,			

181	HKACQ38	975382	191	1 - 1140	515	Thr-62 to Asn-71, Asn-174 to Gly-181. Pro-1 to Trp-6, Pro-19 to Pro-27, Ala-61 to Asp-70, Ala-93 to Ser-102, Asp-109 to Ser-123, Arg-137 to Thr-154, Pro-163 to Ser-169, Ser-199 to Arg-207, Ser-225 to Gly-239, Gln-255 to Ser-269, Ala-279 to Gly-284, Gln-329 to Cys-338, His-365 to Tyr-370.	AR089: 56, AR061: 23 L0766: 6, L0748: 3, L0779: 3, S0360: 2, H0545: 2, L0769: 2, H0539: 2, L0731: 2, L0759: 2, L0599: 2, H0295: 1, L0622: 1, L0021: 1, H0052: 1, H0546: 1, H0457: 1, H0086: 1, H0123: 1, H0413: 1, H0494: 1, L0646: 1, L0768: 1, L0381: 1, L0659: 1, L0783: 1, L0809: 1, L0790: 1, L0666: 1, L0663: 1, S3012: 1, L0747: 1, S0276: 1, H0543: 1 and H0352: 1.		
		948607	315	39 - 1220	639	Arg-9 to Trp-20, Pro-33 to Pro-41, Ala-75 to Asp-84, Ala-107 to Ser-116, Asp-123 to Ser-137, Arg-151 to Thr-168, Pro-177 to Ser-183, Ser-213 to Arg-221,			

182	HE9GZ52	964579	192	1 - 252	516	Ser-239 to Gly-253, Gln-269 to Ser-283, Ala-293 to Gly-298, Gln-343 to Cys-352, His-379 to Tyr-384.	AR089: 1, AR061: 0 H0013: 1, H0050: 1, S6028: 1 and H0144: 1.		
183	HSYBD55	1197348	193	3 - 446	517	Ser-7 to Arg-12.	AR089: 1, AR061: 1 H0052: 1 and H0551: 1.		
184	HTAJM37	863287	316	3 - 446	640	Ser-7 to Arg-12.			
		1152423	194	3 - 653	518	Lys-52 to Tyr-57, Val-115 to Gly-122, Gln-152 to Pro-159.	AR089: 18, AR061: 11 S0278: 1, H0635: 1, H0038: 1, H0560: 1, H0539: 1, H0521: 1 and L0748: 1.		
		911599	317	119 - 847	641	Gln-9 to Gly-14, Gln-21 to Gln-27, Cys-29 to Gln-38, Pro-52 to Trp-62, Lys-109 to Tyr-114, Val-172 to Gly-179, Gln-209 to Pro-216.			
185	HSDJH63	941120	195	45 - 1250	519	Thr-17 to Lys-23, Lys-93 to Arg-98.	AR089: 17, AR061: 14 H0615: 2, L0766: 2, S0114: 1 H0650: 1		

									H0657: 1, L0791: 1, H0689: 1, S0152: 1, S0260: 1 and H0445: 1.			
186	HNNAG23	1137691	196	15 - 509	520				AR089: 1, AR061: 0 H0677: 19, H0255: 6, H0318: 5, H0264: 3, L0766: 3, H0656: 2, H0620: 2, L0655: 2, L0659: 2, H0583: 1, H0650: 1, S0222: 1, H0441: 1, H0486: 1, T0082: 1, H0421: 1, H0354: 1, H0688: 1, L0768: 1, L0794: 1, L0809: 1, L0665: 1, H0134: 1 and H0445: 1.			
		967549	318	66 - 716	642	Arg-12 to Arg-21, Pro-35 to Pro-41, Gly-46 to Cys-52, Thr-75 to Gly-84, Thr-87 to Ser-93.						
187	HYAAL21	943135	197	212 - 1159	521	Leu-9 to Leu-14, Pro-22 to Ser-27, Val-132 to Trp-138.			AR089: 20, AR061: 5 H0038: 2, H0583: 1, H0125: 1, H0046: 1, H0529: 1, S0216: 1, H0144: 1, H0539: 1 and S0027: 1.			
188	HPBCF69	946469	198	212 - 688	522				AR061: 8, AR089: 3			

189	HWDAE40	947007	199	157 - 2022	523	<p>Asn-118 to Leu-123, Gly-212 to Thr-217, Arg-265 to Phe-272, Asn-286 to Asp-294, Ala-356 to Asn-364, Cys-385 to Arg-392, Val-437 to Glu-450, Glu-497 to Leu-502, Lys-553 to Tyr-569.</p>	<p>T0006: 1 AR061: 0, AR089: 0 L0748: 10, L0749: 7, L0439: 6, L0731: 6, L0750: 5, S0222: 4, L0756: 4, L0758: 4, L0598: 3, L0754: 3, L0745: 3, L0747: 3, L0777: 3, L0752: 3, L0755: 3, H0170: 2, H0171: 2, H0455: 2, S6028: 2, T0069: 2, L0662: 2, L0776: 2, L0665: 2, H0144: 2, L0438: 2, L0744: 2, L0759: 2, L0485: 2, H0624: 1, S6024: 1, S0400: 1, H0255: 1, L0005: 1, S0358: 1, S0045: 1, H0619: 1, L0717: 1, H0441: 1, H0600: 1, H0486: 1, H0427: 1, H0599: 1, H0590: 1, S0010: 1, S0346: 1, H0581: 1, H0596: 1, H0327: 1, L0157: 1, L0471: 1, H0355: 1, H0267: 1,</p>		
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190	HUVHH77	948377	200	84 - 1019	524	Trp-4 to Pro-9, Phe-36 to Ser-47.	AR061: 4, AR089: 2 L0439: 6, L0777: 6, L0748: 2, L0747: 2, H0171: 1, H0013: 1, H0081: 1, S0250: 1, H0623: 1, S0426: 1, L0521: 1 and L0759: 1.	14q24-q32	107970, 115650, 123270, 182600, 245200, 251600, 270100, 276900,
							S0316: 1, H0687: 1, S0250: 1, S0003: 1, H0622: 1, H0031: 1, H0628: 1, H0169: 1, H0591: 1, H0038: 1, H0560: 1, H0509: 1, L0769: 1, L0638: 1, L0771: 1, L0649: 1, L0803: 1, L0657: 1, L0659: 1, L0636: 1, L0518: 1, L0788: 1, L0666: 1, L0663: 1, L0664: 1, H0659: 1, H0648: 1, S0330: 1, S0380: 1, H0555: 1, H0627: 1, S0390: 1, L0757: 1, S0260: 1, L0480: 1, S0026: 1, S0194: 1, S0196: 1, S0456: 1 and H0506: 1.		

191	HTLIT03	966870	201	2 - 823	525	His-1 to Asp-7, Asp-56 to Tyr-64.	AR061: 11, AR089: 5 H0457: 10, H0253: 7, H0618: 5, L0768: 2, L0748: 2, H0657: 1, S0300: 1, H0550: 1, L0021: 1, H0581: 1, H0617: 1, H0606: 1, H0316: 1, H0038: 1, H0616: 1, H0334: 1, L0761: 1, L0764: 1, L0774: 1, L0659: 1, H0519: 1, H0704: 1, L0755: 1, L0758: 1, L0361: 1 and H0543: 1.		602091
192	HUJDA09	951526	202	3 - 779	526	Pro-1 to Asp-23, Ile-55 to Gly-81, Glu-150 to Glu-155, Gly-194 to Gly-200.	AR089: 13, AR061: 3 H0650: 1 and H0292: 1.	Xp11.23	300047, 300071, 300110, 300600, 301000, 301000, 301830, 309470, 309500, 309610, 309850, 311050, 312060

193	HTEPU67	1152262	203	2 - 1342	527	Gly-1 to Arg-7, Ala-26 to Ala-33, Gly-86 to His-91, Ser-153 to Ser-167, Pro-182 to Ser-198, Asn-200 to Ser-214, Glu-234 to His-239, Leu-241 to Arg-247, Ser-259 to Phe-271, Leu-280 to Lys-296, Ser-299 to Gln-311, Ala-335 to Ala-342, Glu-356 to Gln-362, Gln-369 to Ile-379, Arg-401 to His-408, Tyr-415 to Thr-420, Ser-435 to Pro-446.	AR061: 4, AR089: 3 L0743: 2, L0779: 2, S0046: 1, H0457: 1, L0471: 1, H0616: 1, L0598: 1, L0794: 1, L0659: 1, L0809: 1, H0547: 1, L0777: 1, S0026: 1 and S0398: 1.		
194	HULFI52	948288 952928	319 204	1 - 546 2 - 559	643 528	Ala-58 to Ala-65. Arg-1 to Ala-15, Arg-17 to Gly-22, Asp-121 to Leu-128, Asp-180 to Tyr-185.	AR089: 8, AR061: 5 L0779: 10, L0731: 9, L0775: 7, L0740: 6, H0666: 5, H0341: 4, L0769: 4, L0766: 4, L0758: 4, S0278: 3, S0222: 3, H0370: 3, S0003: 3, S0144: 3, L0768: 3, L0774: 3, H0659: 3, S0380: 3,		

						H0134: 3, L0748: 3, L0747: 3, L0749: 3, L0759: 3, H0556: 2, H0295: 2, H0662: 2, S0045: 2, H0393: 2, H0599: 2, H0421: 2, H0596: 2, H0644: 2, H0494: 2, H0529: 2, L0520: 2, L0762: 2, L0639: 2, L0646: 2, L0375: 2, L0655: 2, L0530: 2, H0144: 2, H0682: 2, H0658: 2, H0624: 1, H0170: 1, H0686: 1, S0134: 1, S0218: 1, H0657: 1, H0661: 1, H0638: 1, H0125: 1, S0418: 1, S0358: 1, S0360: 1, S0007: 1, S6026: 1, H0411: 1, H0643: 1, H0574: 1, H0492: 1, L0622: 1, S0010: 1, S0182: 1, H0318: 1, T0071: 1, S0049: 1, H0230: 1, H0196: 1, T0110: 1, H0530: 1, H0546: 1, L0157: 1,					
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195	HTEPV02	1152263	205	2 - 586	529	Gly-1 to Ala-6, Ser-19 to Ser-27, Phe-31 to Leu-55, Glu-72 to His-79, Asn-120 to Gly-126, Arg-158 to Arg-163.	L0594: 1, S0026: 1, H0542: 1, H0422: 1 and S0424: 1. AR061: 6, AR089: 2 H0616: 3, L0758: 2, L0768: 1, L0792: 1 and L0779: 1.		
		917406	320	1 - 471	644	Ser-9 to Ser-17, Phe-21 to Leu-45.			
196	HTHBT91	954877	206	257 - 433	530		AR061: 5, AR089: 5 L0766: 9, H0657: 4, L0520: 4, H0170: 3, S0360: 3, H0040: 3, L0794: 3, H0144: 3, S0354: 2, T0039: 2, H0412: 2, H0494: 2, L0764: 2, S0126: 2, L0748: 2, L0752: 2, L0755: 2, S0026: 2, H0422: 2, H0556: 1, S0218: 1, H0583: 1, H0656: 1, S0116: 1, H0341: 1, H0669: 1, H0661: 1, S0418: 1, L0005: 1, S0045: 1, S0132: 1, H0642: 1,		

						H0427: 1, L0021: 1, H0581: 1, H0596: 1, L0040: 1, H0530: 1, H0050: 1, L0471: 1, H0373: 1, S0051: 1, S0003: 1, H0615: 1, H0622: 1, L0483: 1, H0674: 1, H0038: 1, H0616: 1, H0063: 1, S0426: 1, L0598: 1, L0646: 1, L0768: 1, L0803: 1, L0774: 1, L0775: 1, L0655: 1, L0659: 1, L0518: 1, L0809: 1, L0529: 1, L0541: 1, L0790: 1, H0520: 1, H0547: 1, H0684: 1, H0659: 1, H0670: 1, H0539: 1, S0378: 1, L0744: 1, L0747: 1, L0750: 1, L0777: 1, L0731: 1, S0260: 1, H0445: 1, L0583: 1, L0608: 1, H0665: 1, H0136: 1, S0194: 1, H0543: 1, H0423: 1 and H0506: 1.	
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197	HFV1H16	1164631	207	64 - 1440	531	Arg-31 to Val-38, Arg-80 to Pro-90, Asn-183 to Val-190, Val-318 to Leu-327, Leu-329 to Leu-354, Gln-357 to Glu-367, Leu-373 to Glu-380, Arg-391 to Gly-396, Ser-444 to Ser-457.	AR061: 2, AR089: 2 H0393: 1, N0006: 1 and H0690: 1.		
198	HTJAB35	813110	322	64 - 390	646	Arg-31 to Val-38, Arg-80 to Pro-90.	AR089: 14, AR061: 3 H0063: 2, H0487: 1 and H0445: 1.		
		491273	208	519 - 313	532				
		853995	323	358 - 185	647				
199	HRABP94	880424	324	239 - 457	648		AR089: 5, AR061: 2 S0126: 3, H0624: 1, H0341: 1, S0282: 1, H0550: 1, H0253: 1, H0031: 1, T0042: 1, H0555: 1, L0740: 1 and L0596: 1.		
		970481	209	219 - 1433	533	Met-1 to Gly-17, Pro-22 to Gly-30, Gly-72 to His-82, Leu-89 to Lys-95.			
200	HWAGC08	958139	210	1 - 432	534	Asn-31 to Leu-38, Cys-53 to Cys-64, Gly-139 to Cys-144.	AR089: 1, AR061: 1 L0596: 4, L0758: 2, H0392: 1, S0010: 1, H0581: 1, H0038: 1,		

201	HRDET35	945350	211	12 - 998	535				L0761: 1, L0521: 1, L0766: 1 and H0696: 1. AR089: 6, AR061: 6 H0124: 5, L0662: 4, L0744: 4, L0659: 3, H0550: 2, H0050: 2, L0769: 2, L0794: 2, L0766: 2, L0791: 2, L0666: 2, L0438: 2, L0743: 2, L0779: 2, L0777: 2, L0757: 2, H0445: 2, S0418: 1, S0376: 1, H0619: 1, S0222: 1, H0587: 1, H0486: 1, H0599: 1, H0618: 1, H0253: 1, S0049: 1, H0231: 1, H0024: 1, H0622: 1, H0617: 1, L0770: 1, L0761: 1, L0644: 1, L0803: 1, L0774: 1, L0783: 1, L0809: 1, H0626: 1, L0439: 1, L0747: 1, L0749: 1 and L0750: 1.		
202	HGBIA24	1153890	212	1 - 714	536	Gly-1 to Pro-11, Gln-71 to Thr-77, Arg-187 to Lys-193,			AR061: 5, AR089: 2 L0662: 4, L0756: 4, L0777: 4, L0758: 4,		

					Arg-204 to Ser-209, Asp-228 to Tyr-238.	L0649: 3, L0666: 3, S0412: 3, H0171: 2, S0001: 2, S0356: 2, S0360: 2, H0580: 2, H0014: 2, H0038: 2, H0040: 2, L0809: 2, L0665: 2, H0144: 2, H0547: 2, L0602: 2, L0740: 2, L0746: 2, L0747: 2, L0731: 2, H0542: 2, H0624: 1, L0174: 1, H0661: 1, S0046: 1, H0333: 1, H0427: 1, H0581: 1, H0052: 1, H0687: 1, S0250: 1, H0328: 1, H0615: 1, H0553: 1, H0628: 1, S0364: 1, H0056: 1, L0564: 1, H0625: 1, H0652: 1, S0422: 1, S0002: 1, L0598: 1, L0640: 1, L0763: 1, L0646: 1, L0794: 1, L0803: 1, L0375: 1, L0805: 1, L0776: 1, L0657: 1, L0659: 1, L0783: 1, L0791: 1, L0532: 1,			
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										L0663: 1, L0565: 1, H0519: 1, H0670: 1, H0436: 1, H0478: 1, L0748: 1, L0779: 1, L0752: 1, L0757: 1, H0445: 1, S0011: 1, H0667: 1 and S0398: 1.				

205	HJMBN52	966226	215	3 - 611	539	Thr-3 to Gln-9, Phe-36 to Ala-41, His-52 to Ala-63, Ala-81 to Ser-100, Pro-122 to Ser-134.	S0390: 1, S0028: 1 and L0749: 1. AR061: 1, AR089: 1 H0402: 2, H0617: 2, L0766: 2, L0659: 2, H0624: 1, H0341: 1, S0212: 1, S0356: 1, S0046: 1, H0370: 1, H0427: 1, H0545: 1, L0769: 1, L0764: 1, L0794: 1, L0651: 1, L0809: 1, L0789: 1, L0438: 1, H0658: 1, H0539: 1, L0439: 1, L0758: 1 and H0445: 1.		
206	HUFCN47	1197927	216	684 - 1490	540	Gly-58 to Cys-64, Lys-74 to Gln-81, Thr-90 to Asp-99, Met-113 to Ser-118, Met-144 to Gln-150, Gln-166 to Gly-173, Thr-180 to Leu-187, Ser-246 to Asp-256.	AR089: 10, AR061: 0 L0803: 12, L0749: 8, L0747: 6, L0755: 6, L0758: 6, L0748: 5, L0439: 5, L0731: 5, L0759: 5, L0662: 4, L0659: 4, L0740: 4, H0052: 3, H0090: 3, H0040: 3, L0666: 3, H0547: 3, S0330: 3, H0521: 3, L0779: 3, L0608: 3, S0276: 3, S0356: 2, S0360: 2,		

H0580: 2, H0156: 2, H0318: 2, H0050: 2, S6028: 2, H0032: 2, S0366: 2, H0316: 2, H0591: 2, H0059: 2, L0763: 2, L0774: 2, L0775: 2, L0809: 2, L0665: 2, L0438: 2, H0659: 2, H0555: 2, L0744: 2, L0754: 2, L0746: 2, H0171: 1, H0265: 1, S0040: 1, H0656: 1, H0341: 1, S0358: 1, S0376: 1, S0132: 1, H0619: 1, H0587: 1, H0333: 1, H0485: 1, H0486: 1, H0013: 1, S0010: 1, H0421: 1, H0251: 1, L0471: 1, H0014: 1, H0510: 1, H0375: 1, H0428: 1, H0553: 1, H0617: 1, S0036: 1, H0412: 1, S0386: 1, H0641: 1, H0652: 1, S0422: 1, H0529: 1, L0773: 1, L0766: 1, L0776: 1, L0527: 1,						
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207	HHEUC31	910435	326	1 - 549	650	Ser-12 to Arg-23, Arg-56 to Asp-62.	L0789: 1, L0790: 1, L0663: 1, L0664: 1, H0144: 1, H0682: 1, H0670: 1, H0672: 1, S0328: 1, H0539: 1, S0152: 1, H0522: 1, S0146: 1, S0404: 1, L0356: 1, H0478: 1, L0750: 1, L0752: 1, L0581: 1, L0697: 1, S0446: 1 and H0506: 1.		
		1091624	217	3 - 677	541	Glu-26 to Pro-35, Glu-56 to Ser-62, Gln-67 to Val-73, Ser-77 to Thr-82, Ala-90 to Val-104, Thr-126 to Glu-134, Pro-205 to Pro-211.	AR089: 4, AR061: 2 H0543: 2 and L0596: 1.		
		795268	327	3 - 677	651	Glu-26 to Pro-35, Glu-56 to Ser-62, Gln-67 to Val-73, Ser-77 to Thr-82, Ala-90 to Val-104, Thr-126 to Glu-134, Pro-205 to Pro-211.			
208	HUISAI47	1197928	218	45 - 1601	542	Ala-38 to Thr-45 Pro-205 to Pro-211.	AR089: 251 - AR061:		

Ser-70 to Asp-77, Ser-85 to Asp-90, Asp-139 to Gly-145, Ile-207 to Asp-213, Arg-229 to Met-234, Gly-259 to Ser-264, Ile-281 to Ser-288, Asp-337 to Leu-343, Gln-369 to Ile-376, Gly-429 to Ser-440, Gln-448 to Val-456, Gln-461 to Thr-474.						130 L0766: 16, L0749: 13, L0748: 12, L0777: 9, L0740: 6, H0341: 3, H0144: 3, H0268: 2, L0779: 2, L0780: 2, H0624: 1, S0430: 1, H0661: 1, S0420: 1, S0045: 1, S0046: 1, S0222: 1, H0013: 1, H0544: 1, L0157: 1, H0320: 1, H0428: 1, H0040: 1, H0551: 1, H0412: 1, H0623: 1, L0564: 1, H0560: 1, H0646: 1, L0520: 1, L0769: 1, L0772: 1, L0364: 1, L0803: 1, L0650: 1, L0378: 1, L0791: 1, L0666: 1, H0519: 1, H0539: 1, S0152: 1, H0521: 1, S0044: 1, H0436: 1, L0754: 1, L0747: 1, L0750: 1, L0731: 1, L0758: 1, L0589: 1, L0608: 1, L0366: 1, S0192: 1 and H0543: 1.
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209	HHFGD38	911607	328	18 - 644	652	Ala-38 to Thr-45, Ser-70 to Asp-77, Ser-85 to Asp-90, Asp-139 to Gly-145, Arg-189 to Asp-196.	AR061: 8, AR089: 4 L0759: 3, S0152: 2, L0749: 2, H0441: 1, H0013: 1, H0427: 1, H0156: 1, H0318: 1, H0597: 1, H0050: 1, S0386: 1, H0538: 1, L0803: 1 and L0809: 1.		
210	HVAOG11	766126 1152275	329 220	159 - 563 161 - 886	653 544	Asn-16 to Ser-23, Lys-53 to Val-61, Leu-77 to Asp-89, Leu-116 to Ala-121, Glu-152 to Lys-168, Arg-178 to Lys-183, Asp-196 to Glu-203, Glu-220 to Ser-233.	AR089: 2, AR061: 1 H0014: 1, H0039: 1, S0380: 1 and L0740: 1.		
211	HUVDR03	966135 974684	330 221	226 - 861 1 - 780	654 545	Asn-16 to Ser-23, Lys-53 to Asp-60. Leu-27 to Pro-34, Pro-40 to Lys-51, Asn-85 to Phe-90, Arg-102 to Leu-140,	AR089: 5, AR061: 3 L0747: 12, L0766: 10, H0683: 9, L0776: 7, H0521: 6, L0764: 4,		

Gly-145 to Asp-191, Glu-219 to His-227.	L0439: 4, L0731: 4, H0624: 3, S0222: 3, H0457: 3, H0051: 3, L0770: 3, L0769: 3, L0790: 3, L0666: 3, L0664: 3, H0547: 3, L0750: 3, L0757: 3, L0759: 3, H0050: 2, H0056: 2, S0210: 2, L0662: 2, L0774: 2, L0519: 2, L0665: 2, H0519: 2, L0748: 2, L0751: 2, S0242: 2, H0556: 1, H0657: 1, H0341: 1, H0484: 1, H0125: 1, S0418: 1, S0354: 1, S0300: 1, S0278: 1, H0370: 1, H0392: 1, H0438: 1, H0600: 1, H0592: 1, T0039: 1, H0250: 1, H0427: 1, H0042: 1, H0575: 1, H0004: 1, H0581: 1, H0421: 1, H0012: 1, H0083: 1, H0408: 1, H0355: 1, H0266: 1, H0271: 1, H0622: 1, H0169: 1,
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									H0135: 1, H0264: 1, H0272: 1, H0488: 1, H0412: 1, H0623: 1, H0059: 1, H0625: 1, H0641: 1, S0426: 1, L0761: 1, L0646: 1, L0773: 1, L0803: 1, L0657: 1, L0659: 1, L0663: 1, S0428: 1, H0701: 1, S0148: 1, L0438: 1, H0520: 1, H0659: 1, H0648: 1, H0672: 1, S0328: 1, S0380: 1, H0627: 1, H0631: 1, S0028: 1, L0744: 1, L0754: 1, L0756: 1, L0779: 1, L0752: 1, S0434: 1, L0605: 1, L0485: 1, H0136: 1, S0192: 1, H0543: 1, H0422: 1 and S0412: 1.					
212	HUDAE29	689811	222	58 - 288	546				AR089: 13, AR061: 4 L0750: 2, H0370: 1, H0494: 1 and S0042: 1.					
213	HIBC189	954681	223	1968 - 229	547	His-3 to Leu-15, Tyr-28 to Ala-34, Gly-52 to Glu-57.			AR061: 1, AR089: 1 S0048: 1 and T0010: 1.					

					Ser-123 to Gly-136.				
				331	367 - 1713	655			
214	HIBEG40	963279 504158	224	29 - 403	548	Phe-15 to Glu-24.	AR089: 1, AR061: 1 L0439: 4, T0010: 2 and H0038: 1.		
215	HWBEG33	1195806	225	3 - 1784	549	Pro-26 to Ala-38, Lys-85 to Gly-97, Tyr-120 to Glu-131, Asp-158 to Leu-168, Asn-187 to Gly-197, Ser-204 to Asp-209.	AR089: 14, AR061: 6 H0693: 44, L0604: 5, S0366: 4, L0805: 4, H0637: 3, L0766: 3, H0672: 3, H0549: 2, H0271: 2, L0777: 2, H0661: 1, H0580: 1, H0173: 1, H0620: 1, H0428: 1, S0364: 1, L0641: 1, L0644: 1, L0655: 1, L0809: 1, L0791: 1, L0666: 1, L0663: 1, T0068: 1, H0576: 1, L0780: 1, L0731: 1, L0584: 1 and H0543: 1.		
		702070	332	103 - 591	656	Lys-51 to Gly-63, Tyr-86 to Glu-97.			
216	HWHKD22	1150878	226	3 - 317	550	Thr-1 to Arg-7, Asn-34 to Gly-41, Thr-67 to Asn-75.	AR089: 14, AR061: 8 L0766: 3, L0805: 3, L0659: 3, L0744: 3, L0794: 2, L0776: 2, L0665: 2, H0648: 2		

								H0305: 1, H0586: 1, H0599: 1, H0428: 1, H0551: 1, L0763: 1, L0637: 1, L0662: 1, L0768: 1, L0803: 1, L0804: 1, L0806: 1, L0655: 1, L0661: 1, L0787: 1, S0374: 1, H0520: 1, L0740: 1, L0750: 1, L0756: 1, L0777: 1, L0752: 1, L0759: 1 and L0592: 1.		
217	HSLFO41	963626	333	152 - 508	657	Asn-48 to Gly-55, Thr-81 to Asn-89.		AR089: 1, AR061: 0 S0052: 1 and S0028: 1.		
218	HE9SE46	944511	228	1 - 1083	552	Ser-40 to Tyr-45, Ala-61 to Pro-71, Gly-92 to Asp-98, Ala-145 to Asp-151, Pro-197 to Cys-205, Leu-224 to Gly-235, Glu-241 to Ala-254, Ser-256 to Asn-262, Asp-279 to Glu-290, Ser-296 to Gly-303, Lys-340 to Arg-345, Ile-347 to Tyr-354.	AR061: 1, AR089: 1 L0776: 20, L0777: 9, L0439: 6, L0438: 4, L0752: 4, L0591: 4, H0013: 3, H0052: 2, H0024: 2, L0415: 1, S0212: 1, S0360: 1, H0586: 1, H0596: 1, H0050: 1, S0050: 1, H0373: 1, S0051: 1, S6028: 1, H0188: 1, S0386: 1, S0448: 1,			

219	HTLDW37	864276	229	216 - 836	553	Thr-1 to Leu-7.	S0306: 1, L0369: 1, L0774: 1, L0775: 1, L0805: 1, H0144: 1, T0068: 1, S0330: 1, L0745: 1, L0750: 1, L0779: 1, L0755: 1, L0731: 1, S0260: 1, L0596: 1, L0608: 1 and H0665: 1.		
220	HWAFG54	1227138	230	17 - 2389	554		AR089: 18, AR061: 18 H0618: 1, H0253: 1, H0012: 1, H0620: 1, H0181: 1 and H0617: 1.		
		1056330	334	144 - 2336	658	Met-1 to Lys-11, Asp-96 to Ile-104, Asn-127 to Ser-140, Gln-185 to Arg-190, Lys-221 to Ser-231, Ala-254 to Val-262, His-295 to Asp-300, Leu-304 to Ser-323, Ser-327 to Gln-333, Ala-345 to Ser-354, Ala-370 to Ser-384, Thr-396 to Gly-402, Leu-413 to Pro-423,	AR089: 1, AR061: 1		

221	HKAFS73	810433	231	3 - 410	555	Gly-432 to Val-438, Ser-478 to Phe-485, Arg-487 to Lys-506, Ser-528 to Ser-547, Asn-557 to Ala-566, Asp-586 to Glu-597, Glu-644 to Pro-656, Leu-663 to Arg-671, Ser-700 to Asp-707.	AR089: 31, AR061: 25		
222	HTXJD74	921175	232	3 - 752	556		AR061: 7, AR089: 4 S0116: 2, H0510: 2, H0144: 2, H0521: 2, L0748: 2, H0556: 1, T0049: 1, H0580: 1, H0393: 1, H0587: 1, H0051: 1, H0375: 1, H0622: 1, H0488: 1, H0646: 1, S0002: 1, L0752: 1 and L0731: 1.		
223	HSIGQ50	932448	233	1 - 1302	557	Arg-50 to Gln-56, Gly-109 to Glu-119, Gln-131 to Asp-137, Gly-149 to Gly-159, Leu-184 to Glu-218, Val-239 to Ile-245.	AR061: 1, AR089: 1 H0457: 8, H0255: 6, L0743: 4, H0650: 2, S0354: 2, H0581: 2, L0747: 2, H0341: 1, S0376: 1, H0580: 1, H0069: 1, H0042: 1,	16q22.1	103850, 114835, 116800, 140100, 140100, 192090, 192090,

									H0036: 1, H0590: 1, H0251: 1, H0085: 1, H0123: 1, H0687: 1, H0213: 1, H0135: 1, H0040: 1, H0646: 1, S0002: 1, H0593: 1, H0555: 1, L0748: 1, L0731: 1, L0758: 1, L0596: 1, H0543: 1 and H0506: 1.		192090, 192090, 245900, 245900, 276600, 600223
224	HWWDY45	932607	234	3 - 647	558		Gly-40 to Gly-46, Gln-60 to Arg-69, Lys-84 to Trp-91, Leu-112 to Arg-118.		AR089: 1, AR061: 1, H0657: 1, S0376: 1, H0123: 1, H0428: 1, L0646: 1, L0662: 1, L0803: 1, L0659: 1, L0790: 1, L0791: 1, H0660: 1 and L0759: 1.		
225	HNSMB24	971537	235	3 - 677	559		Ser-15 to Tyr-24, Met-47 to Tyr-56, Gly-127 to Ser-133.		AR089: 34, AR061: 19, L0664: 2, H0483: 1, S0376: 1, L0762: 1, L0638: 1, L0771: 1, L0657: 1, L0783: 1, L0665: 1, H0658: 1, H0670: 1 and L0779: 1.		

226	HWLOU63	946862	236	691 - 662	560		AR089: 3, AR061: 2 L0774: 3, L0771: 2, L0766: 2, L0779: 2, S0376: 1, L0646: 1, L0764: 1, L0666: 1, L0748: 1, L0731: 1, L0593: 1 and H0423: 1.	6	
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[35] The first column in Table 1A provides the gene number in the application corresponding to the clone identifier. The second column in Table 1A provides a unique "Clone ID NO:Z" for a cDNA clone related to each contig sequence disclosed in Table 1A. This clone ID references the cDNA clone which contains at least the 5' most sequence of the assembled contig and at least a portion of SEQ ID NO:X was determined by directly sequencing the referenced clone. The reference clone may have more sequence than described in the sequence listing or the clone may have less. In the vast majority of cases, however, the clone is believed to encode a full-length polypeptide. In the case where a clone is not full-length, a full-length cDNA can be obtained by methods described elsewhere herein.

[36] The third column in Table 1A provides a unique "Contig ID" identification for each contig sequence. The fourth column provides the "SEQ ID NO:" identifier for each of the contig polynucleotide sequences disclosed in Table 1A. The fifth column, "ORF (From-To)", provides the location (i.e., nucleotide position numbers) within the polynucleotide sequence "SEQ ID NO:X" that delineate the preferred open reading frame (ORF) shown in the sequence listing and referenced in Table 1A, column 6, as SEQ ID NO:Y. Where the nucleotide position number "To" is lower than the nucleotide position number "From", the preferred ORF is the reverse complement of the referenced polynucleotide sequence.

[37] The sixth column in Table 1A provides the corresponding SEQ ID NO:Y for the polypeptide sequence encoded by the preferred ORF delineated in column 5. In one embodiment, the invention provides an amino acid sequence comprising, or alternatively consisting of, a polypeptide encoded by the portion of SEQ ID NO:X delineated by "ORF (From-To)". Also provided are polynucleotides encoding such amino acid sequences and the complementary strand thereto.

[38] Column 7 in Table 1A lists residues comprising epitopes contained in the polypeptides encoded by the preferred ORF (SEQ ID NO:Y), as predicted using the algorithm of Jameson and Wolf, (1988) *Comp. Appl. Biosci.* 4:181-186. The Jameson-Wolf antigenic analysis was performed using the computer program PROTEAN (Version 3.11 for the Power MacIntosh, DNASTAR, Inc., 1228 South Park Street Madison, WI). In specific embodiments, polypeptides of the invention comprise, or alternatively consist of, at least one, two, three, four, five or more of the predicted epitopes as described in Table 1A. It will be appreciated that depending on the analytical criteria used to predict antigenic determinants, the exact address of the determinant may vary slightly.

[39] Column 8 in Table 1A provides an expression profile and library code: count for each of the contig sequences (SEQ ID NO:X) disclosed in Table 1A, which can routinely be combined with the information provided in Table 4 and used to determine the tissues, cells, and/or cell line libraries which predominantly express the polynucleotides of the invention. The first number in column 8 (preceding the colon), represents the tissue/cell source identifier code corresponding to the code and description provided in Table 4. For those identifier codes in which the first two letters are not "AR", the second number in column 8 (following the colon) represents the number of times a sequence corresponding to the reference polynucleotide sequence was identified in the tissue/cell source. Those tissue/cell source identifier codes in which the first two letters are "AR" designate information generated using DNA array technology. Utilizing this technology, cDNAs were amplified by PCR and then transferred, in duplicate, onto the array. Gene expression was assayed through hybridization of first strand cDNA probes to the DNA array. cDNA probes were generated from total RNA extracted from a variety of different tissues and cell lines. Probe synthesis was performed in the presence of ^{33}P dCTP, using oligo(dT) to prime reverse transcription. After hybridization, high stringency washing conditions were employed to remove non-specific hybrids from the array. The remaining signal, emanating from each gene target, was measured using a Phosphorimager. Gene expression was reported as Phosphor Stimulating Luminescence (PSL) which reflects the level of phosphor signal generated from the probe hybridized to each of the gene targets represented on the array. A local background signal subtraction was performed before the total signal generated from each array was used to normalize gene expression between the different hybridizations. The value presented after "[array code]:" represents the mean of the duplicate values, following background subtraction and probe normalization. One of skill in the art could routinely use this information to identify normal and/or diseased tissue(s) which show a predominant expression pattern of the corresponding polynucleotide of the invention or to identify polynucleotides which show predominant and/or specific tissue and/or cell expression.

[40] Column 9 in Table 1A provides a chromosomal map location for certain polynucleotides of the invention. Chromosomal location was determined by finding exact matches to EST and cDNA sequences contained in the NCBI (National Center for Biotechnology Information) UniGene database. Each sequence in the UniGene database is assigned to a "cluster"; all of the ESTs, cDNAs, and STSs in a cluster are believed to be derived from a single gene. Chromosomal mapping data is often available for one or more

sequence(s) in a UniGene cluster; this data (if consistent) is then applied to the cluster as a whole. Thus, it is possible to infer the chromosomal location of a new polynucleotide sequence by determining its identity with a mapped UniGene cluster.

[41] A modified version of the computer program BLASTN (Altshul et al., J. Mol. Biol. 215:403-410 (1990); and Gish and States, Nat. Genet. 3:266-272 (1993)) was used to search the UniGene database for EST or cDNA sequences that contain exact or near-exact matches to a polynucleotide sequence of the invention (the 'Query'). A sequence from the UniGene database (the 'Subject') was said to be an exact match if it contained a segment of 50 nucleotides in length such that 48 of those nucleotides were in the same order as found in the Query sequence. If all of the matches that met this criteria were in the same UniGene cluster, and mapping data was available for this cluster, it is indicated in Table 1A under the heading "Cytologic Band". Where a cluster had been further localized to a distinct cytologic band, that band is disclosed; where no banding information was available, but the gene had been localized to a single chromosome, the chromosome is disclosed.

[42] Once a presumptive chromosomal location was determined for a polynucleotide of the invention, an associated disease locus was identified by comparison with a database of diseases which have been experimentally associated with genetic loci. The database used was the Morbid Map, derived from OMIM™ (*supra*). If the putative chromosomal location of a polynucleotide of the invention (Query sequence) was associated with a disease in the Morbid Map database, an OMIM reference identification number was noted in column 10, Table 1A, labelled "OMIM Disease Reference(s)". Table 5 is a key to the OMIM reference identification numbers (column 1), and provides a description of the associated disease in Column 2.

TABLE 1B

Clone ID NO:Z	SEQ ID NO:X	CONTIG ID:	BAC ID: A	SEQ ID NO:B	EXON From-To
HE2KJ64	12	906019	AC020570	659	1-67 406-542 1507-1624 2333-2429 4080-4222 4398-4455 4561-4630 4836-4971 7386-7427 7521-7596
HE2KJ64	12	906019	AC020570	660	1-247
HLICC37	14	856958	AL365356	661	1-195 1135-2232 2239-3110
HLICC37	14	856958	AL365356	662	1-173
HLICC37	14	856958	AL365356	663	1-141
HLTER04	23	590990	AC018845	664	1-273 320-800 866-1324 1551-2419 3945-4348 5055-5373 5597-5685 6123-6519 7020-7482 7751-7856 8955-9162 9398-9496 10809-11159 13498-13544 13809-14276 14343-14490 14632-14762 16544-18402
HLTER04	23	590990	AC007338	665	1-273 320-801 867-1325 1552-2420

					3946-4349 5056-5374 5598-5686 6124-6520 7021-7483 7752-7857 8956-9163 9399-9497 10810-11160 13499-13545 13810-14277 14344-14491 14633-14763 16545-18403
HLTER04	23	590990	AC018845	666	1-249
HLTER04	23	590990	AC007338	667	1-249
H2MBY83	25	752124	AC017104	668	1-540
H2MBY83	25	752124	AC017104	669	1-548
HMZAD58	27	975304	AC078916	670	1-364
HMZAD58	27	975304	AC022305	671	1-686
HMZAD58	27	975304	AC002518	672	1-247
HMZAD58	27	975304	AC072032	673	1-364
HMZAD58	27	975304	AC078916	674	1-288
HMZAD58	27	975304	AC072032	675	1-288
HCHNH17	28	975378	AC026236	676	1-141
HBIMF04	36	951601	AL022328	677	1-103 1215-1770 2471-2545 3028-3108 3680-3960 4352-4494 4925-5476 6623-6828 6888-9053 9409-10241
HBIMF04	36	951601	AL022328	678	1-333
HBIMF04	36	951601	AL022328	679	1-186 376-570 1511-2312 2355-2630 2996-3446

					3617-4004 4225-5042 5275-5664 5695-5783 6915-7130 7265-7787 8377-9065 9159-9294 9608-9952 10071-10419 11431-11799 12322-12621 12641-12911 14491-14580 14653-14848 15670-15856 15949-16109 16183-16596
HOCQD08	39	972981	AC018568	680	1-1718
HOCQD08	39	972981	AC018568	681	1-425
HE8DL23	43	693641	AL135999	682	1-63 405-942 1196-1502 2152-6417 6659-6755 7033-7385 7481-7535 7647-8163 8230-8492 8590-9909 10114-10360 10420-10783 10970-11960 12018-13492 14130-14528 14563-15789
HE8DL23	43	693641	AL135999	683	1-410
HAJBU67	55	856922	AC008910	684	1-1685 1960-2928
HAJBU67	55	856922	AC026230	685	1-1686 1961-2933

HAJBU67	55	856922	AC008910	686	1-326
HAJBU67	55	856922	AC026230	687	1-91
HAJBU67	55	856922	AC026230	688	1-325
HCEMY90	68	932927	AC024242	689	1-274 1243-1357 1994-2270
HCEMY90	68	932927	AF214633	690	1-274 1243-1357 1994-2270
HCEMY90	68	932927	AC024242	691	1-232
HCEMY90	68	932927	AF214633	692	1-130
HHFLF63	69	933854	AC023295	693	1-75 1512-1564
HDTDG41	72	942490	AL137848	694	1-175 2422-2550 3441-3583 4018-4129 8219-8689 9767-9876 11592-11892 14228-14324 15025-15162 16319-16590 17309-18595
HDTDG41	72	942490	AL137848	695	1-196
HFEBN52	82	810429	AL136001	696	1-61 290-371 654-779 2128-2223 2337-2372 2507-2674 3747-4249 4554-4644 5223-5557 5604-5916 6827-6930 6949-7329 7852-8047
HFEBN52	82	810429	AL359399	697	1-61 290-371 654-779

					2128-2223 2337-2372 2507-2674 3747-4249 4554-4644 5221-5555 5602-5914 6825-6928 6947-7327 7850-8045
HFEBN52	82	810429	AL136001	698	1-430
HFEBN52	82	810429	AL359399	699	1-430
HAJBH69	99	812164	AL035496	700	1-565 855-1099 2067-4150 4159-4449 4474-4747 5104-5234 5852-5937 6421-6561 7510-7799 8583-9223 9477-9989 10109-10208 11605-12056 12474-12574 13276-13359 14559-14890 14968-16129 16629-16740 16984-17214 17460-17816
HMAER78	102	702735	AC074333	701	1-357
HTEPM33	105	870561	AL132776	702	1-42 1020-1195 2173-2338 6839-7029 11880-12103
HTEPM33	105	870561	AL132776	703	1-173
HTEPM33	105	870561	AL132776	704	1-791
HDTEJ81	107	919873	AC004707	705	1-74

					285-478 553-872 2612-4708 4745-5348
HDTEJ81	107	919873	AC004707	706	1-318 1694-1796 2541-2601 2726-3334 4150-4509 4632-4791 5026-5134 8019-8346 8944-9470 12238-12412 14290-16770 17028-17771 19503-19606 21647-22467
HCGMG56	118	953660	AC004707	707	1-604 641-2737 4477-4796 4871-5064 5275-5348
HCGMG56	118	953660	AC004707	708	1-821 2862-2965 4697-5440 5698-8178 10056-10230 12998-13524 14122-14449 17334-17442 17677-17836 17959-18318 19134-19742 19867-19927 20672-20774 22150-22467
HE8MI76	123	911474	AL137008	709	1-97 446-576 761-1233 3775-3946

					4867-5024 5520-5729 8345-8467 10681-10858 11553-11879 12483-14416 14439-14940 15077-15549 15779-15907 20468-20613 21617-21807 23498-23598 23636-23733 23851-24271 25734-26340 26686-26850 27674-27830 28001-28075 29807-30301 30480-31201 31218-31488 31758-31878 32812-33412 33772-34391 34798-34911 36778-37158 37234-37825 38688-39969
HNSAB28	154	881286	AC010188	710	1-151 1103-1517 2286-2664 4067-4735 4740-4859 5876-6449 7178-7278 7318-7451 7539-7983 8131-8235 8418-9210 9619-9776 11087-12216

HNSAB28	154	881286	AC010188	711	1-420 442-1482
HTTEP70	155	917729	AC005546	712	1-84 94-607 687-742 971-1123 1271-1463 2970-3130 3726-3851 3920-4035 4307-4724 5193-5352 6432-6975 7007-7190 7271-7363 7504-7738 7747-7841 8468-8620 8879-8995 9088-9166 9632-9736 9743-9875 9953-10058 10840-10955 11128-11473 11656-11837
HTTEP70	155	917729	AC005546	713	1-74
HUSGZ51	162	955542	AC018568	714	1-1718
HUSGZ51	162	955542	AC018568	715	1-425
HNFFR23	165	585289	AC008751	716	1-343
HFOZC96	167	926685	AF238376	717	1-145 304-383 2385-2851 3341-3588 4343-4428 4631-4797 6602-6724 7496-8173 8368-9341
HHERB37	169	708477	AL355377	718	1-505 662-2071

HKAED89	178	827573	AF038458	719	1-630 1311-1416 2481-4022 4952-5252 6370-6479 7623-8269
HWWT02	185	908017	AC004188	720	1-150 500-1073 1818-2402 2467-3243 3940-4026
HWWT02	185	908017	AB014086	721	1-150 500-1072 1817-2401 2466-3242 3939-4025
HWWT02	185	908017	AC004188	722	1-699
HWWT02	185	908017	AB014086	723	1-699
HODFI03	187	918008	AC007041	724	1-402 3126-3268 3901-4312 4472-5358 6517-6670 6767-7912 8251-8380 8609-8730 9249-9427 9575-10072 10942-11345 11359-11545 11877-14991
HODFI03	187	918008	AC007041	725	1-322
HODFI03	187	918008	AC007041	726	1-381
HWHHR02	188	919169	AF053356	727	1-71 234-304 320-826 878-1099 1233-1683 2077-3297
HWHHR02	188	919169	AF053356	728	1-434
HWHHR02	188	919169	AF053356	729	1-152

HSVBQ03	189	924850	AC004477	730	1-326 1029-1626 2309-2345 2958-3015 3982-4124 5005-5248 5482-6071 6519-6577 7045-7136 7692-7780 8037-8184 9575-9866 10372-10789 11501-11618
HE9GZ52	192	964579	AL359881	731	1-183 574-652 897-1212 1599-1902
HE9GZ52	192	964579	Z98884	732	1-569 4314-4514 4905-4983 5228-5543 5930-6233
HE9GZ52	192	964579	Z98884	733	1-298
HSDJH63	195	941120	AC012224	734	1-1316
HSDJH63	195	941120	AC044892	735	1-1394
HSDJH63	195	941120	AC006252	736	1-1394
HSDJH63	195	941120	AC006252	737	1-111 281-410 1326-1983
HWDAE40	199	947007	AC016605	738	1-2114
HWDAE40	199	947007	AC008917	739	1-107 510-2620
HWDAE40	199	947007	AC008917	740	1-426
HUVHH77	200	948377	AL132641	741	1-2545
HUVHH77	200	948377	AL132641	742	1-4063 4990-5958
HUVHH77	200	948377	AL132641	743	1-775
HTLIT03	201	966870	AC009077	744	1-89 471-679 809-978

					3619-4024 5223-5374 6500-6876 7519-7607 8279-8386 8536-9192
HTLIT03	201	966870	AC004531	745	1-84 643-971 1003-1047 2794-2855 7497-7541 8459-8546 8885-9170 12745-12811 12995-13065 14987-15122 16524-16612 16994-17202 17332-17501 20142-20547 21746-21897 23023-23399 24802-24909 25059-25715
HTLIT03	201	966870	AC009077	746	1-139
HTLIT03	201	966870	AC009077	747	1-114
HTLIT03	201	966870	AC004531	748	1-108
HRABP94	209	970481	AL136222	749	1-73 226-264 289-1812 1968-2177 2300-2813 2951-3091 3146-3222 3597-3888
HRABP94	209	970481	AL109947	750	1-35 90-146 603-976 1504-1816 1908-2118 2389-2496

					3139-4163 5195-5455 5670-5784 5971-6356 6875-7024 7362-8082 8097-9620 9776-9985 10108-10621 10759-10899 10954-11030 11405-11696
HRABP94	209	970481	AL359711	751	1-35 90-146 603-976 1504-1816 1908-2118 2389-2496 3139-4163 5195-5455 5670-5784 5971-6356 6875-7024 7362-8082 8097-9620 9776-9985 10108-10621 10759-10899 10954-11030 11405-11696
HRABP94	209	970481	AL136222	752	1-479 502-655 841-948 1038-1393 1624-1713 1856-1951 2057-2373 2467-2567 2696-3160
HRABP94	209	970481	AL109947	753	1-479 502-655

					841-948 1038-1393 1624-1713 1856-1951 2057-2373 2467-2567 2696-3160
HRABP94	209	970481	AL359711	754	1-479 502-655 841-948 1038-1393 1624-1713 1856-1951 2057-2373 2467-2567 2696-3160
HRABP94	209	970481	AL109947	755	1-532
HRABP94	209	970481	AL359711	756	1-532
HTTHF21	213	921596	AC013264	757	1-1071 3263-3406 4512-4719
HTTHF21	213	921596	AC074092	758	1-1071
HTTHF21	213	921596	AC013264	759	1-527
HTTHF21	213	921596	AC074092	760	1-527
HJMBN52	215	966226	AF276758	761	1-184 756-1081 1289-1644 3033-3467
HJMBN52	215	966226	AC024049	762	1-184 755-1080 1283-1637 3026-3458
HSIGQ50	233	932448	AC015551	763	1-250 418-479 572-642 1076-1152 2851-2927 3010-3133 3242-3338 3438-3518 3612-3715

					3840-3987 4189-4308 4594-4869 4912-5046 5149-5298 5473-6592 6692-6760 6805-7073 7286-7514 7744-7833 8003-8545 8778-8913 9249-9703
HSIGQ50	233	932448	AC019214	764	1-160 713-910 1069-1269 3997-4098 4303-4397 5035-5098 5740-5796 6024-6155 6697-6813 6937-7029 7110-7349 7432-7571 7573-7601 7834-7907 8326-8490 8712-8804 8894-8979 9090-9171 9368-9467 9622-9730 9821-10012 10197-10277 10440-10562 10668-11103 11203-11432 11937-12052 12251-12312 12794-13183

					13257-13343 13483-13996 14001-14146 14369-14483 14587-15046 15053-15302 15470-15534 15624-15695 16128-16212 17904-17980 18066-18189 18298-18394 18494-18574 18668-18771 18896-19043 19245-19364 19650-19925 19968-20102 20205-20354 20529-21648 21748-21816 21861-22129 22341-22569 22799-22888 23058-23600 23833-23968 24304-24757
HSIGQ50	233	932448	AC019214	765	1-803 1028-1918
HNSMB24	235	971537	AC015555	766	1-61 464-586 752-1423 3455-3587 5766-5958 6757-7115 8075-8329 8778-8876 12309-12455 13123-13279 16212-17107
HNSMB24	235	971537	AP001623	767	1-61

					464-586 752-1423 3455-3580 4976-5021 5793-5958 6757-7115 8075-8329 8778-8876 12305-12451 13119-13275 16208-17104
HNSMB24	235	971537	AC015555	768	1-674
HNSMB24	235	971537	AP001623	769	1-674

[43] Table 1B summarizes additional polynucleotides encompassed by the invention (including cDNA clones related to the sequences (Clone ID NO:Z), contig sequences (contig identifier (Contig ID:) contig nucleotide sequence identifiers (SEQ ID NO:X)), and genomic sequences (SEQ ID NO:B). The first column provides a unique clone identifier, "Clone ID NO:Z", for a cDNA clone related to each contig sequence. The second column provides the sequence identifier, "SEQ ID NO:X", for each contig sequence. The third column provides a unique contig identifier, "Contig ID:" for each contig sequence. The fourth column, provides a BAC identifier "BAC ID NO:A" for the BAC clone referenced in the corresponding row of the table. The fifth column provides the nucleotide sequence identifier, "SEQ ID NO:B" for a fragment of the BAC clone identified in column four of the corresponding row of the table. The sixth column, "Exon From-To", provides the location (i.e., nucleotide position numbers) within the polynucleotide sequence of SEQ ID NO:B which delineate certain polynucleotides of the invention that are also exemplary members of polynucleotide sequences that encode polypeptides of the invention (e.g., polypeptides containing amino acid sequences encoded by the polynucleotide sequences delineated in column six, and fragments and variants thereof).

TABLE 2

Clone ID NO:Z	Contig ID:	SEQ ID NO:X	Analysis Method	PFam/NR Description	PFam/NR Accession Number	Score/ Percent Identity	NT From	NT To
HFRBN59	1106393	11	blastx.14	Hypothetical fimbrial chaperone in pepN-pyrD intergenic region . [Escherichia coli]	gi 4062512 dbj BAA3 5699.1	82%	212	445
HFRBN59	739539	237	HMMER 1.8	PFAM: Fimbrial proteins	PF00419	19.62	86	232
HE2KJ64	906019	12	HMMER 1.8	PFAM: SCP-like extracellular Proteins	PF00188	66.3	35	277
			blastx.14	(AF109674) late gestation lung protein 1 [Rattus norvegicus]	gi 4324682 gb AAD1 6986.1	74%	2	364
HAGDV32	1178626	13	blastx.2	Diacylglycerol kinase iota (Fragment).	sp AAF43006 AAF43 006	100%	19	243
HAGDV32	699372	238	HMMER 1.8	PFAM: Ank repeat	PF00023	15.79	41	121
HLICC37	856958	14	HMMER 2.1.1	PFAM: Ank repeat	PF00023	33.1	53	151
HBGBU96	1121900	15	blastx.2	hypothetical 30.8 kD protein in gltF-nanT intergenic region - Escherichia coli (strain K- 12)	pir H65113 H65113	79%	3	449
HBGBU96	848220	239	HMMER 2.1.1	PFAM: ROK family	PF00480	65.2	3	125
HAIJCQ63	823850	16	HMMER 2.1.1	PFAM: Ank repeat	PF00023	96.9	175	267

HLMMV66	1153903	17	blastx.2	CENTAURIN BETA2.	sp Q9UQR3 Q9UQR3	63%	242	628
HLMMV66	926188	240	HMMER 1.8	PFAM: Ank repeat	PF00023	17.86	245	322
			blastx.14	similar to HUMORFU (D26069) [Homo sapiens]	gi 488505 dbj BAA06418.1	62%	230	382
						81%	337	384
						86%	404	448
HLWAR08	1096389	18				71%	378	419
						39%	173	256
						43%	99	146
			blastx.14	(AF160798) calcium transporter CaT1 [Rattus norvegicus]	gi 5712756 gb AAD47636.1 AF160798_1	91%	151	450
HLWAR08	959139	241	HMMER 1.8	PFAM: Ank repeat	PF00023	100%	1	144
						89%	447	533
						30%	1	99
						46%	61	99
HBGTT76	1152327	19	HMMER 1.8	PFAM: Ank repeat	PF00023	13.97	3	44
			blastx.2	Shank3b protein.	sp CAB89816 CAB89816	72%	7	468
						62.3	197	295
			HMMER 2.1.1	PFAM: Ank repeat	PF00023			
HBGTT76	903653	242	blastx.14	(AJ133120) Proline rich synapse associated protein 2 [Rattus norvegicus]	gi 5262748 emb CAB45688.1	72%	131	556
						47%	499	561
						59.5	216	308
			HMMER 2.1.1	PFAM: Ank repeat	PF00023			
HMCFO24	924647	20	blastx.14	UNC-44 [Caenorhabditis elegans]	gi 790608 gb AAA85854.1	41%	186	323
						34%	57	203
						37%	195	353
						36%	174	323
HMCFO24	924647	20				48%	219	323
						43%	192	323

HBIOM94	973137	21	HMMER 2.1.1 blastx.2	PFAM: Ank repeat			34%	174	323
				contains 10 ankyrin-like repeats; similar to human ankyrin, 1 bursaria Chlorella virus 1]	gb AAC96986.1		48% 46% 38% 33% 42% 26% 29% 47% 34% 47% 50%	102 90 60 75 219 78 78 3 3 9 427	182 173 167 182 323 200 170 71 71 65 462
HBJLR11	1012465	22	blastx.2	Sterol regulatory element binding protein 3.	sp AAF67491 AAF67491		58%	62	388
HBJLR11	956568	243	HMMER 1.8 blastx.14	PFAM: LIM domain containing proteins	PF00412		53.39	2088	1915
				mutant sterol regulatory element binding protein-2 1	gi 841318 gb AAA85718.1		66% 45% 66%	2097 1728 531	1804 1585 478
HBJLR11	975276	244	blastx.14	mutant sterol regulatory element binding protein-2 1	gi 841318 gb AAA85718.1		63% 60%	1037 1085	762 1041
HLTER04	590990	23	HMMER 2.1.1	PFAM: DnaJ central domain (4 repeats)	PF00684		128.3	90	350
HMSMU30	823859	245	HMMER 1.8	PFAM: Ank repeat	PF00023		12.82	191	244

H2MBY83	752124	25	HMMER 2.1.1 blastx.2	PFAM: Protein of unknown function	PF01951	137	80	493
HBUAH93	1164739	26	blastx.2	CG6353 PROTEIN.	sp Q9VVD92 Q9VVD92	58%	80	493
			blastx.2	CDNA FLJ10852 FIS, CLONE NT2RP4001498, WEAKLY SIMILAR TO 1	sp BAA91856 BAA9 1856	51%	130	1299
HBUAH93	810424	246	HMMER 2.1.1	PFAM: Ank repeat	PF00023	35.4	340	438
HMZAD58	975304	27	HMMER 2.1.1 blastx.14	PFAM: Putative GTP-ase activating protein for Arf	PF01412	196.5	362	739
			blastx.14	(AF124491) ARF GTPase-activating protein GIT2 [Homo sapiens]	gi 4691728 gb AAD2 8047.1 AF124491_1	89% 100% 97% 25% 34% 33% 29%	368 1964 1712 1730 2000 1280 1445	1813 2509 1972 1894 2104 1360 1546
HCHNH17	975378	28	HMMER 2.1.1 blastx.2	PFAM: LIM domain containing proteins	PF00412	31.3	896	1009
HBWAJ55	971772	247	blastx.2	LIM and cysteine-rich domains protein 1.	sp AAF34411 AAF34 411	90% 34%	116 917	1009 1021
			HMMER 2.1.1 blastx.2	PFAM: Ank repeat ankyrin G [Homo sapiens]	PF00023 gb AAA64834.1	321.4	820	918
			HMMER 2.1.1			95% 39% 37% 34% 36% 32% 33% 39%	91 163 130 163 166 106 103 163	1239 1182 1182 1206 1185 1182 1188 609

HNJCE31	1152346	30	blastx.2	ASB-1 PROTEIN.			38%	148	597
HNJCE31	911597	248	HMMER 2.1.1	PFAM: Ank repeat	sp Q9Y576 Q9Y576	PF00023	100%	1230	244
			blastx.14	(AF156777) ASB-1 protein [Homo sapiens]	gi 5306062 gb AAD41894.1 AF156777_1		85	354	440
HKAIU14	919538	31	HMMER 2.1.1	PFAM: Uncharacterised protein family	PF01980		100%	81	1031
			blastx.2	CDNA FLJ20206 FIS, CLONE COLF1582.	sp BAA91013 BAA91013		100%	34	75
HCE4I12	911586	32	HMMER 2.1.1	PFAM: Ank repeat	PF00023		26%	985	1074
			blastx.2	CG6268 PROTEIN.	sp Q9VCA7 Q9VCA7		147.9	148	519
							99%	25	1314
							72.3	106	195
							70%	1	369
							48%	13	396
							44%	28	312
							44%	4	288
							39%	4	312
							36%	4	291
							35%	4	312
							34%	4	279
							57%	315	356
							53%	315	359
HFOYI18	926488	33	HMMER 2.1.1	PFAM: Domain of unknown function	PF01942		26.4	255	569
			blastx.14	(AC004077) hypothetical protein [Arabidopsis thaliana]	gi 3128208 gb AAC26688.1		23%	426	716
							32%	144	308
							46%	300	422
							58%	726	797
HHEDM89	945055	34	HMMER 2.1.1	PFAM: N2,N2-dimethylguanosine tRNA methyltransferase	PF02005		132	22	828

			blastx.2	(AP000007) 381aa long hypothetical N2,N2- dimethylguanosine tRNA methyltransferase [Pyrococcus horikoshii]	dbj BAA30948.1	35%	16	720
HFxKW18	945288	35	HMMER 2.1.1	PFAM: Domain of unknown function 2	PF00563	65.2	2104	2310
			blastx.2	Hypothetical 67.7 kd protein CY02B10.18C. [Escherichia coli]	dbj BAA35528.1	99%	529	2337
HBIMF04	951601	36	HMMER 2.1.1	PFAM: TraB family	PF01963	191.2	336	1043
			blastx.2	(AL022328) dJ402G11.4 (novel protein similar to C. elegans F38A5.2 (isoform 1)) [Homo sapiens]	emb CAB63043.1	99% 80% 100%	405 1085 160	1130 1249 237
HEEAU28	946972	249	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	67.2	46	207
			blastx.14	ajuba; jub [Mus musculus]	gi 1710382 gb AAB3 8287.1	67% 37%	13 292	327 339
HDPKI66	823854	38	HMMER 2.1.1	PFAM: Ank repeat	PF00023	50.4	293	391
			blastx.2	DIFFERENTIATION ENHANCING FACTOR 1.	sp O97902 O97902	62%	2	1399
HOCQD08	972981	39	HMMER 2.1.1	PFAM: Protein of unknown function	PF02000	42.2	38	307
			blastx.14	phosphorylation regulatory protein HP-10 - human	pir A61382 A61382	78% 98%	320 78	715 326

HDPRP54	1228283	40	blastx.2	CDNA FLJ10852 FIS, CLONE NT2RP4001498, WEAKLY SIMILAR TO 1	sp BAA91856 BAA9 1856	96%	75	1517
HDPRP54	502892	250	HMMER 1.8	PFAM: Ank repeat	PF00023	20.99	330	401
HE2BW32	609468	41	HMMER 2.1.1	PFAM: MSP (Major sperm protein) domain	PF00635	87.1	19	192
HAJAU21	670606	42	HMMER 2.1.1	PFAM: Adaptin N terminal region	PF01602	194.1	2	322
			blastx.2	gamma-adaptin precursor - mouse	pir A36680 A36680	95%	2	319
HE8DL23	693641	43	HMMER 2.1.1	PFAM: Adaptin N terminal region	PF01602	131.4	29	343
			blastx.2	GAMMA2-ADAPTIN.	sp O75504 O75504	83% 100%	29 408	406 470
HFTCM92	928851	44	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	43.25	178	351
			blastx.2	ALPHA-ACTININ-2 ASSOCIATED LIM PROTEIN.	sp O70209 O70209	36% 90%	22 22	357 51
HFTCM92	948605	251	blastx.14	carboxyl terminal LIM domain protein [Homo sapiens]	gi 1905874 gb AAC0 5580.1	64% 30%	581 662	456 585
HE6BQ76	775616	45	HMMER 2.1.1	PFAM: Double-stranded RNA binding motif	PF00035	28.1	155	223
			blastx.2	PROTEIN ACTIVATOR OF THE INTERFERON- INDUCED PROTEIN KINASE.	sp O75569 O75569	66% 94%	146 109	340 159
HAMFP60	715097	46	HMMER	PFAM: Clathrin adaptor	PF01217	150.3	164	460

HHFHY84	715098	47	2.1.1	complex small chain PFAM: Clathrin adaptor complex small chain	PF01217	78.2	129	305
HE6FD03	1150900	48	blastx.2	CG1800 PROTEIN.	sp Q9V9V7 Q9V9V7	36%	846	403
HE6FD03	859840	252	HMMER 2.1.1	PFAM: Double-stranded RNA binding motif	PF00035	26.1	283	390
HDFTFT90	1165338	49	blastx.2	CDNA FLJ10860 FIS, CLONE NT2RP4001568, WEAKLY SIMILAR TO 1	sp BAA91862 BAA9 1862	88% 66%	2 211	217 399
HDFTFT90	944518	253	HMMER 1.8	PFAM: Ank repeat	PF00023	17.29	190	249
HPJCU63	904598	254	HMMER 2.1.1	PFAM: Ank repeat	PF00023	187.9	735	833
			blastx.14	ankyrin [Drosophila melanogaster]	gi 557084 gb AAC37 208.1	33% 32% 30% 31% 36% 30% 37% 29% 36% 25% 38% 36% 31% 32% 41% 29% 32% 42%	126 126 123 123 339 111 219 129 201 204 144 120 123 342 135 117 501 744	833 815 725 638 737 707 605 710 593 731 503 413 521 707 404 410 695 827

HFITE38	793203	51	HMMER 2.1.1 blastx.2	PFAM: MAGE family DJI409.2 (MELANOMA- ASSOCIATED ANTIGEN MAGE LIKE).	PF01454 sp O76058 O76058	40% 37% 32% 28% 35% 56% 34%	726 738 600 732 732 923 726	815 833 737 836 824 970 812
HDPDH64	796509	52	HMMER 2.1.1	PFAM: Adaptin N terminal region	PF01602	46.4	148	246
HFKKS58	1158800	53	blastx.2	CDNA FLJ10259 FIS, CLONE HEMBB1000947, HIGHLY SIMILAR TO 1	sp BAA91511 BAA9 1511	99%	2	1135
HFKKS58	914398	255	HMMER 2.1.1	PFAM: RNase3 domain.	PF00636	102.6	443	712
HE8CM38	1197903	54	blastx.2	NG28.	sp Q9Z1P7 Q9Z1P7	61%	2	565
HE8CM38	932013	256	HMMER 2.1.1 blastx.14	PFAM: Ank repeat similar to ankyrin of Chromatium vinosum. [Homo sapiens]	PF00023 gi 1136404 dbj BAA1 1489.1	93.8 99% 90%	257 2 525	355 508 557
HAJBU67	856922	55	HMMER 2.1.1	PFAM: eRF1-like proteins	PF01605	28.1	514	606
HHEHD10	1204696	56	blastx.2	hypothetical protein DKFZp434B1517.1 -	pir T34532 T34532	82% 96%	562 3	1458 278

HHHD10	894411	257	HMMER 1.8	human (fragment) PFAM: LIM domain containing proteins	PF00412	28.72	48	224
HHHD45	919630	57	HMMER 1.8	PFAM: Double-stranded RNA binding motif	PF00035	12.86	25	114
HE8EQ22	1031960	58	blastx.2	ASB-3 PROTEIN (CDNA FLJ10123 FIS, CLONE HEMBA1002939, WEAKLY 1	sp Q9Y575 Q9Y575	82% 94% 42%	199 695 674	702 751 751
HE8EQ22	911594	258	HMMER 2.1.1	PFAM: Ank repeat	PF00023	128.9	430	528
HSACD83	911588	59	blastx.14	(AF156778) ASB-3 protein [Homo sapiens]	gi 5306064 gb AAD4 1895.1 AF156778_1	94% 37% 70% 36%	199 433 792 718	786 615 884 783
			HMMER 2.1.1	PFAM: Ank repeat	PF00023	47	160	258
HHGBO53	1091714	60	blastx.2	WUGSC:H_DJ1035O02.1 PROTEIN (FRAGMENT).	sp Q9UDM3 Q9UD M3	58% 53%	169 438	402 554
			blastx.2	hypothetical protein DKFZp434B1517.1 - human (fragment)	pir T34532 T34532	92% 93% 51% 25%	235 685 27 611	402 771 128 769
HHGBO53	894375	259	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	26.8	133	252
HE8FD82	1154785	61	blastx.2	Hypothetical 35.8 kDa protein.	sp CAC09448 CAC0 9448	99%	8	811
HE8FD82	909634	260	HMMER 2.1.1	PFAM: Putative GTP-ase activating protein for Arf	PF01412	184.7	256	618
			blastx.14	(AL031633) similar to	gi 3880859 emb CAA	57%	265	510

HOHAS44	914810	62	HMMER 2.1.1 blastx.14	Ank repeat (2 domains); cDNA 1	21032.1	42% 46% 46%	502 733 128	732 861 172
HE8OF42	1117857	63	HMMER 2.1.1 blastx.2	PFAM: 7-fold repeat in Clathrin and VPS clathrin heavy chain [Bos taurus]	PF00637 gi 969024 gb AAC48 524.1	104.3 100%	2 2	379 664
HE8OF42	810432	261	HMMER 2.1.1	CDNA FLJ20636 FIS, CLONE KAT03434.	sp BAA91302 BAA9 1302	58% 36% 35% 57%	199 208 181 488	486 483 489 544
HSKHS71	1154798	64	HMMER 2.1.1 blastx.2	PFAM: Ank repeat ankyrin repeat protein A682L - Chlorella virus PBCV-1	PF00023 pir T18184 T18184	47.6 40% 33% 35% 32% 31% 34% 27%	298 52 52 4 7 7 7 4	396 477 726 504 486 504 405 456
HSKHS71	911592	262	HMMER 2.1.1 blastx.14	PFAM: Ank repeat contains 10 ankyrin-like repeats; similar to human 1 [Paramecium bursaria Chlorella virus 1]	PF00023 gi 2447128 gb AAC9 6986.1	63.1 42% 36% 35% 35% 38% 31% 40% 35%	94 106 97 103 100 103 103 196 1	192 366 357 372 372 357 366 381 84
HISBT75	1181020	65	blastx.2	LIM DOMAIN PROTEIN CLP-36.	sp O00151 CL36_HU MAN	40%	37	360

HISBT75	963281	263	HMMER 1.8 blastx.14	PFAM: LIM domain containing proteins carboxyl terminal LIM domain protein [Homo sapiens]	PF00412 gi 1905874 gb AAC0 5580.1	43.09	129	302
HFVKF77	930964	66	HMMER 2.1.1 blastx.14	PFAM: 7-fold repeat in Clathrin and VPS clathrin heavy chain [Bos taurus]	PF00637 gi 969024 gb AAC48 524.1	642.4 98% 100% 100% 36% 39% 46% 48% 57% 30% 46% 28%	3205 3718 1741 3788 2014 3788 1936 3535 3289 3196 3558 2011	2780 1748 1583 3705 1940 3720 1892 3461 3248 3128 3514 1937
HJABW64	931402	67	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat hypothetical protein [Silene latifolia]	PF00560 emb CAA73132.1	30.1 48% 39%	340 115 115	408 456 456
HCEMY90	932927	68	HMMER 2.1.1 blastx.2	PFAM: PWVP domain WHSC1 PROTEIN.	PF00855 sp O96028 O96028	48.7 62% 65%	67 67 546	234 585 605
HHFLF63	933854	69	HMMER 2.1.1 blastx.14	PFAM: Repeat in ubiquitin-activating (UBA) proteins Sbx [Mus musculus]	PF02134 gi 54058 emb CAA44 465.1	110.2 36% 44% 35%	487 4 421 277	654 285 654 336

HSKAN19	935229	70	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	41%	642	713
			blastx.14	similar to yeast adenylyate cyclase (S56776) [Homo sapiens]	gi 1504042 dbj BAA1 3220.1	58%	707	742
HE9SE88	894905	264	HMMER 1.8	PFAM: Laminin B (Domain IV)	PF00052	69.4	757	825
HDTDG41	942490	72	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	51%	1	1176
			blastx.14	proteoglycan I precursor [Homo sapiens]	gi 306884 gb AAA36 009.1	1.3	115	189
HTEPX32	870698	73	HMMER 1.8	PFAM: Double-stranded RNA binding motif	PF00035	33.6	236	307
			blastx.2	testis nuclear RNA binding protein - mouse	pir 48840 I48840	60%	206	574
HEGAB84	1128320	74	blastx.2	ankyrin-related protein unc-44 - Caenorhabditis elegans (fragment)	pir A57282 A57282	63%	190	699
HEGAB84	823900	265	HMMER 2.1.1	PFAM: Ank repeat	PF00023	34%	71	475
			blastx.2	ankyrin 3 [Mus musculus]	gb AAB01605.1	31%	119	475
HTEKQ12	1213746	75	blastx.2	probable ATPase SKD3 [imported] - mouse	pir 49045 I49045	38%	197	469
HTEKQ12	947964	266	HMMER 2.1.1	PFAM: Ank repeat	PF00023	36.9	205	315
						37%	28	348
						83%	256	1869
						84%	112	393
						52	140	238

			blastx.14	(AB027570) suppressor of potassium transport defect 3 [Rattus norvegicus]	gi 4958935 dbj BAA78095.1	85% 93%	8 380	289 472
HNTSX71	1221117	76	blastx.2	hypothetical protein DKFZp434G171.1 - human (fragment)	pir T42678 T42678	99%	824	1417
HNTSX71	963289	267	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	54.6	44	217
			blastx.14	thyroid receptor interactor [Homo sapiens]	gi 695374 gb AAC41740.1	44% 47%	14 263	268 406
HNTSX71	974741	268	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	54.6	598	425
			blastx.14	thyroid receptor interactor [Homo sapiens]	gi 695374 gb AAC41740.1	44% 47%	628 379	374 236
HFCFH75	951202	77	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	98.3	134	202
			blastx.2	DJ677H15.1 (A novel protein similar to leucine-rich 1	sp CAC04183 CAC04183	83% 32% 33% 26% 25% 33% 83%	2 242 239 5 8 410 717	694 643 643 628 643 712 767
HEOQY55	1204693	78	blastx.2	CG15118 PROTEIN.	sp Q9V8R1 Q9V8R1	49% 43% 30%	175 1076 1031	1104 1690 1219
HEOQY55	883406	269	HMMER 2.1.1	PFAM: Ank repeat	PF00023	39.9	244	342
HPJDQ48	952185	79	HMMER 2.1.1	PFAM: Clathrin adaptor complex small chain	PF01217	163.3	254	541
			blastx.2	(AB015320) sigma1B	dbj BAA33392.1	74%	257	547

HTTCB17	1174865	80	blastx.2	subunit of AP-1 clathrin adaptor complex [Homo sapiens]		73%	120	242
HTTCB17	948595	270	HMMER 2.1.1 blastx.2	Double-stranded RNA-binding protein p74. PFAM: Double-stranded RNA binding motif spermatid perinuclear RNA binding protein [Mus musculus]	sp AAF59924 AAF59924 PF00035 emb CAA59167.1	83% 90.3% 98%	74 1394 74	2041 1203 1969
HE2SY09	953828	81	HMMER 2.1.1 blastx.14	PFAM: Adaptin N terminal region alpha-adaptin (A) (AA 1-977) [Mus musculus]	PF01602 gi 49878 emb CAA33096.1	323 96%	29 2	646 646
HFEBN52	810429	82	HMMER 2.1.1	PFAM: Ank repeat	PF00023	57.5	64	162
HCHMO62	955551	83	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat (AF062006) orphan G protein-coupled receptor HG38 [Homo sapiens]	PF00560 gb AAC28019.1	55.1 57% 33% 33%	63 6 9 9	134 455 467 428
HHSDM19	956045	84	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat DJ677H15.1 (A novel protein similar to leucine-rich 1)	PF00560 sp CAC04183 CAC04183	32.7 93% 30% 26%	1195 1771 1630 1642	1127 1016 1022 1028
HDTT49	956917	85	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat ErbB2-interacting protein ERBIN.	PF00560 sp AAF77048 AAF77048	68 92% 28% 29%	317 854 842 851	249 3 198 216

HTLGW19	1163072	86	blastx.2	CDNA FLJ20548 FIS, CLONE KAT11542.	sp BAA91250 BAA91250	26%	854	204
HTLGW19	788606	271	HMMER 2.1.1	PFAM: Ank repeat	PF00023	68.1	336	428
HJPCA88	958942	87	HMMER 2.1.1	PFAM: Domain of unknown function	PF01902	177.6	8	529
HE9TA54	960253	88	blastx.2	CG1578 PROTEIN.	sp Q9VYU1 Q9VYU1	54% 47%	11 525	535 656
HCFC40	963756	89	HMMER 2.1.1	PFAM: eIF4-gamma/eIF5/eIF2-epsilon (AF083246) HSPC028 [Homo sapiens]	PF02020	120.3	1148	1390
HHBEN77	1189720	90	blastx.2	PFAM: Pumilio-family RNA binding domains (aka PUM-HD, Pumilio homology domain)	gi 5106787 gb AAD39844.1	100%	143	1366
HHBEN77	951627	272	HMMER	PFAM: Ank repeat	PF00806	263.8	2528	2632
HHBEN77	951627	272	HMMER	PFAM: Ank repeat	sp Q9VHH6 Q9VHH6	76% 38% 64% 45% 36% 35%	1898 4 819 954 1544 920	2956 387 860 1019 1618 1027
HHBEN77	951627	272	HMMER	PFAM: Ank repeat	sp Q9WV06 Q9WV06	86%	23	988
HHBEN77	951627	272	HMMER	PFAM: Ank repeat	PF00023	68.2	566	664

			2.1.1	(AJ011118) skeletal muscle and cardiac protein [Mus musculus]	gi 5420272 emb CAB46646.1	84%	23	736
HHESP66	1154641	91	blastx.2	CDNA FLJ20189 FIS, CLONE COLF0657.	sp BAA91003 BAA91003	94%	129	815
HHESP66	919192	273	HMMER 2.1.1	PFAM: Ank repeat	PF00023	53.2	428	526
HAHHQ37	967442	92	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	63	494	562
			blastx.2	(AF053356) leucin rich neuronal protein [Homo sapiens]	gb AAC78793.1	96%	104	1300
						73%	1100	2011
						100%	18	113
						42%	1186	1368
						36%	1270	1473
						28%	1129	1608
						28%	1626	2009
						36%	138	272
						36%	993	1115
						31%	376	636
						24%	1159	1419
HAMAA10	968749	93	HMMER 2.1.1	PFAM: Nebulin repeat	PF00880	105.2	628	726
			blastx.14	N-RAP [Mus musculus]	gi 2351568 gb AAC53323.1	86%	613	915
						52%	238	534
						70%	97	300
						41%	583	915
						40%	583	915
						48%	79	183
						48%	79	171
						28%	241	510

109	47	61%					
834	730	42%					
828	712	33%					
810	673	32%					
198	79	40%					
408	235	31%					
807	685	39%					
612	439	22%					
834	730	42%					
915	742	34%					
318	223	46%					
834	730	37%					
408	220	25%					
192	79	31%					
192	106	41%					
429	214	22%					
623	546	46%					
240	106	33%					
510	223	25%					
109	56	61%					
624	406	20%					
828	778	58%					
612	439	22%					
306	217	36%					
879	751	32%					
288	208	37%					
723	625	30%					
192	127	54%					
417	331	27%					
624	418	23%					
318	223	31%					
723	625	30%					

915	838	42%						
915	838	38%						
834	778	42%						
309	220	36%						
192	121	41%						
189	121	47%						
585	439	26%						
318	220	27%						
840	706	31%						
393	223	22%						
171	121	52%						
318	223	25%						
573	532	57%						
723	643	37%						
318	217	29%						
189	121	39%						
504	439	45%						
294	223	33%						
426	280	20%						
915	874	64%						
732	685	43%						
915	844	33%						
828	784	53%						
810	697	31%						
828	685	27%						
396	244	19%						
177	124	38%						
201	142	30%						
405	337	30%						
402	340	38%						
915	856	40%						
177	73	25%						

HHFMH12	969324	94	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat (AK001332) unnamed protein product [Homo sapiens]	PF00560 dbj BAA91631.1	68.8	1814	1882
						58% 71%	167 2100	2101 2162
HDTIE58	971339	95	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat (AF133730) Slit1 [Rattus norvegicus]	PF00560 gb AAD25540.1 AF1 33730_1	132.1	1278	1349
						35% 33% 32% 33% 31% 37% 31% 26% 30% 30% 34% 30% 31% 32% 32% 29% 29% 34% 27% 28% 32%	543 1095 1062 543 600 786 714 918 846 786 792 1002 1002 702 858 1194 1074 918 1017 1041 648	1097 1625 1628 1019 1454 1199 1163 1385 1313 1241 1166 1460 1379 1091 1232 1637 1454 1226 1379 1313 947
HIBCN93	973679	96	HMMER 2.1.1 blastx.2	PFAM: MAGE family (AF143235) apoptosis related protein APR-1	PF01454 gb AAD31314.3 AF1 43235_1	28.9	552	644
						99%	282	938

HSWAP86	1165386	97	blastx.2	[Homo sapiens] LIM DOMAIN PROTEIN CLP-36.	sp O00151 CL36_HU MAN	55%	678	499
HSWAP86	947000	274	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	43.69	81	254
			blastx.14	carboxyl terminal LIM domain protein [Homo sapiens]	gi 1905874 gb AAC0 5580.1	64% 38%	135 69	260 131
HSWAP86	948606	275	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	43.78	677	504
			blastx.14	carboxyl terminal LIM domain protein [Homo sapiens]	gi 1905874 gb AAC0 5580.1	64% 35%	623 677	498 627
HHSGI32	1216549	98	blastx.2	NG28.	sp Q9Z1P7 Q9Z1P7	46%	609	1694
HHSGI32	958555	276	HMMER 2.1.1	PFAM: Ank repeat	PF00023	37.8	967	1059
			blastx.14	similar to ankyrin of Chromatium vinosum. [Homo sapiens]	gi 1136404 dbj BAA1 1489.1	83% 75% 39% 87% 52% 64% 34%	151 90 949 32 970 1 952	1194 173 1086 79 1032 42 1029
HAJBH69	812164	99	HMMER 2.1.1	PFAM: VHS domain	PF00790	86.4	9	254
			blastx.2	ADP-RIBOSYLATION FACTOR BINDING PROTEIN GGA1 (GAMMA-ADAPTIN RELATED PROTEIN, GGA1).	sp Q9UJY5 Q9UJY5	95% 95%	3 265	266 324

HAGFN07	953606	100	HMMER 2.1.1 blastx.2	PFAM: Antifreeze protein	PF01354	46.8	266	87
				CDNA FLJ10797 FIS, CLONE NT2RP4000657, WEAKLY SIMILAR TO 1	sp BAA91818 BAA9 1818	99%	797	84
HFRBZ64	575037	101	HMMER 2.1.1	PFAM: DegT/DmrJ/EryC1/StrS family	PF01041	59.6	223	462
HMAER78	702735	102	HMMER 2.1.1	PFAM: 3-dehydroquinase synthase	PF01761	85.6	66	269
HKAAV49	1179713	103	blastx.2	NASOPHARYNGEAL CARCINOMA SUSCEPTIBILITY PROTEIN LZ16.	sp Q9UHR3 Q9UHR 3	90% 100%	10 1010	966 1039
HKAAV49	961297	277	HMMER 2.1.1 blastx.14	PFAM: Ank repeat	PF00023	33.7	617	715
				BRCA1-associated RING domain protein [Homo sapiens]	gi 1710175 gb AAB3 8316.1	49% 60%	566 796	766 864
HAPQS74	855538	104	HMMER 2.1.1 blastx.2	PFAM: START domain	PF01852	43.9	729	430
				GOODPASTURE ANTIGEN-BINDING PROTEIN (EC 2.7.1.37).	sp Q9Y5P4 Q9Y5P4	100%	774	415
HTEPM33	870561	105	HMMER 2.1.1 blastx.2	PFAM: LIM domain containing proteins	PF00412	95.6	4	180
				DJ393D12.2 (novel LIM domain protein).	sp CAB86657 CAB8 6657	97% 30%	4 82	735 711
HLTES49	872262	106	HMMER 2.1.1	PFAM: Ribosomal L27 protein	PF01016	40.2	89	247

HDTJ81	919873	107	HMMER 2.1.1	PFAM: Ribosomal L27 protein	PF01016	58.8	106	333
			blastx.2	HSPC250.				
HTLCY21	910212	108	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	132.9	230	412
			blastx.2	LIM/HOMEBOX PROTEIN LHX4.				
HKAKF45	1090988	109	blastx.2	hypothetical protein DKFZp434E1335.1 - human (fragment)	pir T17278 T17278	88% 40% 30% 35%	1 58 600 244	831 465 839 456
			blastx.14					
HKAKF45	911611	278	HMMER 2.1.1	PFAM: Ank repeat	PF00023	94.9	295	393
			blastx.14	(AJ011118) skeletal muscle and cardiac protein [Mus 1				
HMWDF88	906769	110	HMMER 1.8	PFAM: Low-density lipoprotein receptor domain class A	PF00057	41.61	171	245
			blastx.2	8D6 antigen.				
HHECU86	945062	111	HMMER 2.1.1	PFAM: Glucose inhibited division protein A	PF01134	261.8	199	528
			blastx.2	HYPOTHETICAL PROTEIN CGI-02.				
HTPHO01	1152424	112	blastx.2	LIM and cysteine-rich domains protein 1.	sp AAF34411 AAF34 411	86%	11	646
			blastx.2					
HTPHO01	912348	279	HMMER	PFAM: LIM domain	PF00412	79.1	466	639

				2.1.1	containing proteins				
				blastx.14	testin [Mus musculus]	gi 475210 emb CAA55590.1	48%	241	621
							63%	4	141
							31%	337	498
							29%	541	612
							32%	358	432
HFXXR90	948399	113		HMMER 2.1.1	PFAM: TB domain	PF00683	31.6	240	347
				blastx.2	hypothetical protein DKFZp586M2123.1 - human (fragment)	pir T17298 T17298	83%	168	482
							97%	1	135
							40%	1	132
							35%	180	365
							44%	1	132
							56%	43	132
							33%	1	132
							52%	82	132
							50%	138	191
							69%	532	570
							25%	1	84
HDPBQ32	949191	114		HMMER 2.1.1	PFAM: START domain	PF01852	58.9	366	719
				blastx.2	GTT1.	sp AAF81750 AAF81750	94%	129	1004
HNTAR73	949289	115		HMMER 2.1.1	PFAM: TB domain	PF00683	28.7	131	235
				blastx.2	Latent transforming growth factor beta binding protein 3.	sp AAF62352 AAF62352	82%	2	286
							47%	173	367
							61%	9	101
							77%	283	309
							71%	5	25
HHEGC16	950778	116		HMMER 2.1.1	PFAM: Glucose inhibited division protein A	PF01134	263.1	1136	429

HSIGE72	952275	117	blastx.2	HYPOTHEITICAL PROTEIN CGI-02.	sp Q9Y2Z2 YC02_H UMAN	99% 97%	1136 1495	348 1139
HCGMG56	953660	118	HMMER 2.1.1	PFAM: Molybdenum cofactor biosynthesis protein	PF00994	720.4	362	1645
			blastx.2	gephyrin - rat	pir JH0681 JH0681	99% 100%	182 2	1663 143
HNGBQ66	966001	119	HMMER 2.1.1	PFAM: Ribosomal L27 protein	PF01016	47	119	241
			blastx.2	HSPC250.	sp AAF36170 AAF36 170	84%	29	487
HTXPY09	966013	120	HMMER 2.1.1	PFAM: Putative snoRNA binding domain	PF01798	327.1	1020	1466
			blastx.2	NUCLEOLAR PROTEIN NOP5/NOP58 (NUCLEOLAR PROTEIN 5).	sp Q9Y2X3 Q9Y2X3	93%	264	1529
HCHAS12	966626	121	HMMER 2.1.1	PFAM: Putative snoRNA binding domain	PF01798	39.1	465	551
			blastx.2	hypothetical protein DKFZp564H2171.1 - human (fragment)	pir T17299 T17299	72% 97%	327 103	587 237
H6EDI12	1154053	122	HMMER 2.1.1	PFAM: START domain	PF01852	58.6	562	1014
			blastx.2	CGI-52 PROTEIN.	sp Q9Y365 Q9Y365	90% 69%	262 207	1209 245
H6EDI12	911587	280	HMMER 2.1.1	CG5891 PROTEIN.	sp Q9VUX6 Q9VUX 6	40% 28%	165 572	533 667
			blastx.14	PFAM: Ank repeat	PF00023	73.3	274	372
			blastx.14	130 kDa myosin-binding	gi 633040 dbj BAA07	51%	277	516

HE8MI76	911474	123		subunit of smooth muscle myosin phosphatase (M130) [Gallus gallus]	202.1	38%	274	507
			HMMER 2.1.1	PFAM: Spectrin repeat	PF00435	36%	163	237
			blastx.2	ACTIN BINDING PROTEIN ABP620.	sp Q9UPN3 Q9UPN3	61%	236	961
						72%	3	239
						28%	15	236
						33%	36	236
						26%	6	236
						31%	66	236
						26%	21	239
						33%	63	239
						23%	9	239
						26%	72	254
						29%	24	239
						22%	21	239
						22%	6	251
						26%	6	236
						23%	84	224
						30%	102	290
						20%	9	266
						23%	102	284
						24%	42	296
						21%	159	254
						23%	75	332
						29%	93	236
						22%	39	230
						20%	12	290
						20%	21	239
						20%	12	254
						19%	30	260

HSDGJ23	714160	124	HMMER 2.1.1 blastx.2	PFAM: Uncharacterized membrane protein family DNA-damage-inducible protein f - Escherichia coli (strain K-12)	PF01554 pir C65212 C65212	45.1	229	405
						81% 97%	68 280	232 405
HHSAD81	847391	281	HMMER 2.1.1 blastx.2	PFAM: Integral membrane protein ORF_ID:o306#4; similar to [SwissProt Accession Number P31125] [Escherichia coli]	PF00892 dbj BAA15223.1	126.7	1517	1110
						100%	2	676
HHSAD81	970432	282	HMMER 2.1.1 blastx.2	PFAM: Integral membrane protein ORF_ID:o306#4; similar to [SwissProt Accession Number P31125] [Escherichia coli]	PF00892 dbj BAA15223.1	126.7	268	675
						99%	1	678
HCEEZ56	1171692	126	blastx.2	MJ0495-like protein SelB (Fragment).	sp AAG13375 AAG1 3375	93% 91%	3 1264	1184 1335
HCEEZ56	971572	283	HMMER 1.8 blastx.14	PFAM: Elongation factor Tu family (contains ATP/GTP binding P-loop) cDNA EST EMBL:D73217 comes from this gene; cDNA EST 1 this gene [Caenorhabditis elegans]	PF00009 gi 3874973 emb CAB 16863.1	57.73	144	581
						35% 44% 32% 30%	171 996 423 1158	464 1136 596 1235
HE8TT33	1189455	127	blastx.2	U5-116 KDA.	sp O08810 O08810	99%	3	2189
HE8TT33	952123	284	HMMER 1.8	PFAM: Elongation factor Tu family (contains ATP/GTP binding P-loop)	PF00009	180.76	3	1274

				blastx.14	similar to human elongation factor 2 mRNA (HSEF2). [Homo sapiens]	gi 434759 dbj BAA04 699.1	99%	3	2189
HAGBX32	951351	128	HMMER 2.1.1	HMMER 2.1.1	PFAM: PMP- 22/EMP/MP20/Claudin family	PF00822	182.3	3	476
			blastx.2	blastx.2	VOLTAGE- DEPENDENT CALCIUM CHANNEL GAMMA-3 SUBUNIT 1	sp O60359 CCG3_H UMAN	89%	12	551
HLWEE80	1202534	129	blastx.2	blastx.2	ELONGATION FACTOR TU, MITOCHONDRIAL PRECURSOR (P43).	sp P49411 EFTU_HU MAN	95% 97% 71%	685 323 12	1134 568 179
HLWEE80	840952	286	HMMER 1.8	HMMER 1.8	PFAM: Elongation factor Tu family (contains ATP/GTP binding P-loop)	PF00009	73.51	332	577
HMEFI81	1226739	130	blastx.2	blastx.2	probable translation elongation factor EF-Tu - fission yeast (Schizosaccharomyces pombe)	pir T41396 T41396	57% 60% 54% 35% 31% 38% 29% 60%	165 2985 1806 792 2352 1641 564 888	773 3494 2273 1448 2858 1742 686 932
HMEFI81	574258	287	HMMER 1.8	HMMER 1.8	PFAM: Elongation factor Tu family (contains ATP/GTP binding P-loop)	PF00009	206.25	86	496
HOUHW83	1199942	131	blastx.2	blastx.2	translation elongation factor EF-G, mitochondrial - rat	pir S40780 S40780	85%	184	825
HOUHW83	882335	288	HMMER 1.8	HMMER 1.8	PFAM: Elongation factor Tu family (contains	PF00009	245.38	234	632

HSLCB60	1193050	132	blastx.2	ATP/GTP binding P-loop) ribosomal protein S7 [validated] - Escherichia coli	pir H65127 R3EC7K	100%	820	284
HSLCB60	730740	289	HMMER 2.1.1	PFAM: Elongation factor Tu family	PF00009	197	115	450
HSLFG64	1228145	133	blastx.2	sulfate adenylyltransferase (EC 2.7.7.4) large chain - Escherichia coli	pir JN0327 JN0327	92%	856	2142
HSLFG64	853387	290	HMMER 2.1.1	PFAM: Elongation factor Tu family	PF00009	347.8	1127	54
HTPFX16	974296	134	HMMER 2.1.1	PFAM: PMP- 22/EMP/MP20/Claudin family	PF00822	50.2	48	299
HWAER24	934693	135	blastx.2	CLAUDIN-18.	sp P56857 CLDI_MO USE	67% 44%	39 316	359 483
			HMMER 2.1.1	PFAM: Elongation factor G C-terminus	PF00679	88.1	2156	2398
HKMAC08	1121865	136	blastx.2	probable translation elongation factor EF-Tu - fission yeast (Schizosaccharomyces pombe)	pir T41396 T41396	60% 42% 31% 35% 23% 33%	2045 866 1412 3 202 700	2554 1579 1918 248 507 834
			blastx.2	CAPACITATIVE CALCIUM ENTRY CHANNEL 1 (CAPACITATIVE CALCIUM 1	sp P79100 P79100	86%	193	720
HKMAC08	960388	291	HMMER 2.1.1	PFAM: Ank repeat	PF00023	25.5	400	474

HSLHS93	1105323	137	blastx.14	capacitative calcium entry channel 1 [Bos taurus]	gi 1731930 emb CAA68125.1	86%	193	720
			blastx.2	hypothetical fimbrial-like protein in agai-mtr intergenic reg - Escherichia coli (strain K-12)	pir B65104 B65104	98%	1	150
HSLHS93	791608	292	HMMER 1.8	PFAM: Fimbrial proteins	PF00419	41.58	6	143
HBGOT10	963457	138	HMMER 2.1.1	PFAM: General diffusion Gram-negative porins	PF00267	237.9	3	362
			blastx.14	Outer membrane protein f precursor (outer membrane 1	gi 1651450 dbj BAA35675.1	98% 72%	3 404	365 436
HSDJW73	882817	139	blastx.2	hypothetical protein b2335 - Escherichia coli (strain K-12)	pir E65006 E65006	98% 100%	322 450	2 355
HSDJW73	883338	293	HMMER 1.8	PFAM: Gram-negative pili assembly chaperone	PF00345	135.4	326	688
HWMEQ37	949568	140	HMMER 2.1.1	PFAM: Low-density lipoprotein receptor domain class A	PF00057	30.2	388	459
HFRBX44	1107898	141	blastx.2	probable membrane protein b1411 - Escherichia coli	pir F64892 F64892	94%	432	1685
HFRBX44	860207	294	HMMER 2.1.1	PFAM: ROK family	PF00480	99.1	2	292
HRDDR74	531702	295	HMMER 2.1.1	PFAM: ROK family	PF00480	40.3	91	186
HP1AQ70	1151503	143	blastx.2	flagellar protein flgJ - Escherichia coli	pir F64851 F64851	100%	564	151

HPIAQ70	973604	296	HMMER 1.8	PFAM: Flagella basal body rod proteins	PF00460	41.51	206	298
			blastx.14	Flagellar hook-associated protein 1 (hap1) . [Escherichia coli]	gi 1651528 dbj BAA3 5891.1	77% 100%	322 194	498 322
HROAZ07	973603	144	HMMER 1.8	PFAM: Flagella basal body rod proteins	PF00460	33.9	5	97
			blastx.2	Molybdopterin-converting factor 16k chain [Escherichia coli]	dbj BAA35443.1	70%	113	469
HTTER50	1220586	145	blastx.2	Sec61 alpha isoform 2.	sp AAF66696 AAF66 696	99% 66%	64 1202	1206 1273
HTTER50	724581	297	HMMER 1.8	PFAM: eubacterial secY protein	PF00344	28.69	356	559
HUFBV44	1220585	146	blastx.2	Sec61 alpha isoform 2.	sp AAF66696 AAF66 696	100%	15	338
HUFBV44	851306	298	HMMER 1.8	PFAM: eubacterial secY protein	PF00344	25.6	22	288
HE2EI69	534587	147	HMMER 1.8	PFAM: Gram-negative pili assembly chaperone	PF00345	41.12	152	331
HWMJR63	1152429	148	blastx.2	LIM and cysteine-rich domains protein 1.	sp AAF34411 AAF34 411	90% 34%	117 918	1004 1004
HWMJR63	922134	299	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	31.3	893	1006
			blastx.14	testin [Mus musculus]	gi 475210 emb CAA5 5590.1	62% 51% 48% 34% 32%	377 809 221 905 926	709 1006 370 1000 1000
HSLFD83	667155	149	HMMER 2.1.1	PFAM: SUA5/yciO/yrnC family	PF01300	135.1	18	305

HBKDA90	952737	300	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	53.39	322	495
HBKDA90	956567	301	blastx.14	mutant sterol regulatory element binding protein-2 1	gi 841318 gb AAA85 718.1	80%	214	20
HTLAA37	754641	151	HMMER 2.1.1	PFAM: N2,N2- dimethylguanosine tRNA methyltransferase	PF02005	168.3	5	313
HTRAA36	756908	152	blastx.2	phosphotransferase system enzyme II (EC 2.7.1.69), 1	pir A25336 WQEC2 G	98%	761	318
HTRAA36	827518	302	HMMER 2.1.1	PFAM: Domain of unknown function 2	PF00563	70.6	3	404
HRGDD16	877117	153	HMMER 2.1.1	PFAM: N2,N2- dimethylguanosine tRNA methyltransferase	PF02005	110.7	24	149
HNSAB28	881286	154	blastx.2	R29425_1.	sp O76103 O76103	72%	123	368
			HMMER 2.1.1	PFAM: Similarity to lectin domain of ricin beta-chain, 3 copies.	PF00652	61%	24	290
			blastx.2	UDP- GALNAC:POLYPEPTID EN- ACETYL GALACTOSA MINYL TRANSFERASE.	sp Q9UIV5 Q9UIV5	72%	359	391
HTTEP70	917729	155	HMMER 2.1.1	PFAM: N2,N2- dimethylguanosine tRNA methyltransferase	PF02005	42.4	458	838
HTTEP70	917729	155	blastx.14	(AC005546) R29425_1 [Homo sapiens]	gi 3478637 gb AAC3 3150.1	99%	2	838
			blastx.14			271.2	418	852
HTTEP70	917729	155	blastx.14			93%	109	837
			blastx.14			100%	887	961

HMSII43	946985	156	HMMER 1.8	PFAM: SCP-like extracellular Proteins	PF00188	91.46	86	478
HMADV11	920770	157	blastx.2	CG2337 PROTEIN.	sp Q9VI35 Q9VI35	51%	95	517
			HMMER 2.1.1	PFAM: SUA5/yciO/yrnC family	PF01300	191.3	36	422
HNTCK35	1226201	158	blastx.2	probable translation factor yciO - Escherichia coli	pir F64874 F64874	97% 100%	27 5	416 25
			blastx.2	SEX-DETERMINATION PROTEIN HOMOLOG FEM1A.	sp Q9Z2G1 Q9Z2G1	79% 85%	109 1460	1449 2113
HNTCK35	966597	303	HMMER 1.8	PFAM: Ank repeat	PF00023	26.8	229	297
HTPGQ16	1027781	159	blastx.14	(AF064447) sex- determination protein homolog Fem1a [Mus musculus]	gi 3930525 gb AAC8 2372.1	67% 94%	109 309	309 359
			blastx.2	LATE GESTATION LUNG PROTEIN 1.	sp Q9Z0U6 Q9Z0U6	77%	60	587
HTPGQ16	909618	304	HMMER 1.8	PFAM: SCP-like extracellular Proteins	PF00188	96.61	148	603
HOCMS18	1227594	160	blastx.2	hypothetical protein DKFZp434N161.1 - human	pir T17268 T17268	100%	2433	2729
HOCMS18	961424	305	HMMER 2.1.1	PFAM: Ank repeat	PF00023	78.9	1102	1200
HE8AM58	1204936	161	blastx.14	similar to ankyrin of Chromatium vinosum. [Homo sapiens]	gi 136404 dbj BAA1 1489.1	54% 42% 35% 26% 37%	649 325 415 589 418	1401 474 498 657 489
			blastx.2	LIM/HOMEOBOX	sp O35652 LHX8_M	84%	10	921

HE8AM58	894346	306	HMMER 2.1.1	PROTEIN LHX8 (L3). PFAM: LIM domain containing proteins	OUSE PF00412	83%	875	928
HUSGZ51	955542	162	HMMER 2.1.1 blastx.2	PFAM: Protein of unknown function phosphorylation regulatory protein HP-10 - human	PF02000 pir A61382 A61382	43.7 91%	27 76	299 432
HELEQ48	960866	163	HMMER 2.1.1 blastx.2	PFAM: TS-N domain nascent polypeptide- associated complex alpha chain - human	PF02094 pir S49326 S49326	43.1 51% 81% 55%	223 397 397 500	104 101 332 399
HOFOE03	1226251	164	blastx.2	hypothetical protein DKFZp434D2328.1 - human (fragment)	pir T42691 T42691	50% 44% 32% 31% 28% 31% 28% 28% 30% 30% 55%	1577 1676 2093 1874 2114 1775 2096 2117 1961 2117 3166	30 36 69 51 129 36 771 978 1041 1269 3107
HOFOE03	911616	307	HMMER 2.1.1 blastx.14	PFAM: Ank repeat ankyrin 3 [Mus musculus]	PF00023 gi 710551 gb AAB01 605.1	176.9	316	414
						37% 33% 33% 34% 33% 33%	148 163 169 148 169 163	741 792 777 738 777 786

777	169	32%							
741	151	32%							
777	148	31%							
738	163	33%							
681	295	41%							
747	169	31%							
732	160	28%							
675	178	31%							
753	277	33%							
777	232	31%							
777	340	35%							
582	181	32%							
576	163	31%							
486	163	33%							
143	3	40%							
143	3	38%							
137	3	44%							
143	3	36%							
980	855	33%							
980	852	37%							
137	27	48%							
980	849	36%							
143	27	46%							
959	852	44%							
378	148	32%							
143	27	41%							
980	876	37%							
956	876	51%							
143	27	38%							
143	15	37%							
959	849	35%							
143	27	41%							

HNFFR23	585289	165	HMMER 2.1.1	PFAM: Flagellar P-ring protein	PF02119	41%	27	143
						41%	27	143
						46%	876	953
						41%	27	143
						32%	870	980
						25%	849	980
						50%	876	947
						45%	739	831
						38%	739	831
						35%	27	143
						31%	852	947
						27%	3	143
						52%	915	977
						33%	27	134
						25%	873	980
						31%	876	980
						31%	852	947
						29%	870	980
						33%	733	831
						52%	769	831
						29%	870	980
						30%	27	143
						40%	766	831
						36%	766	831
						36%	766	831
						31%	697	831
						42%	775	831
						45%	772	831
HNFFR23	585289	165	HMMER 2.1.1	PFAM: Flagellar P-ring protein	PF02119	67.1	180	329
HOGCC57	1205511	166	blastx.2	Novel retinal pigment epithelial cell protein.	sp AAF44722 AAF44 722	91%	122	808
						72%	739	792

HOGCC57	911609	308	HMMER 2.1.1 blastx.14	PFAM: Ank repeat overexpressed in thyroid tissue after TSH stimulation [Canis familiaris]	PF00023	116.7	572	670
					gi 1429314 emb CAA 67582.1	50% 28% 38%	164 269 739	772 580 792
HFOZC96	926685	167	HMMER 1.8 blastx.2	PFAM: LIM domain containing proteins LIM DOMAIN PROTEIN CLP-36.	PF00412	43.54	109	282
					sp O00151 CL36_HU MAN	54%	97	288
HOHBK44	823872	168	HMMER 2.1.1 blastx.2	PFAM: Ank repeat hypothetical protein DKFZp434D2328.1 - human (fragment)	PF00023	114.1	330	428
					pir T42691 T42691	63% 33% 36% 39% 34% 34% 32% 33% 35% 31% 30%	6 30 12 12 33 33 12 36 33 36 36	527 506 494 494 464 512 527 506 434 509 497
HHERB37	708477	169	HMMER 2.1.1 blastx.2	PFAM: DnaJ C terminal region HEAT SHOCK PROTEIN HSP40-3.	PF01556	80.4	21	311
					sp O75953 O75953	99%	9	320
HEGAW40	710652	170	HMMER 2.1.1 blastx.2	PFAM: Leucine Rich Repeat LEUCIN RICH NEURONAL PROTEIN.	PF00560	52.9	381	449
					sp O75427 O75427	61% 36% 32%	120 234 135	686 641 572

HDTDQ51	1152264	171	blastx.2	Hypothetical 96.1 kDa protein.	sp BAA95081 BAA95081	87%	151	723
HDTDQ51	823871	309	HMMER 2.1.1	PFAM: Ank repeat	PF00023	32	203	301
HOHCG42	1152272	172	blastx.2	hypothetical protein DKFZp434D2328.1 - human (fragment)	pir T42691 T42691	56%	3	476
						50%	475	930
						36%	6	479
						34%	6	482
						35%	6	476
						34%	490	930
						36%	511	930
						32%	24	476
						34%	6	470
						31%	15	470
						29%	3	476
						29%	6	470
						29%	6	467
						35%	105	443
						29%	490	876
						33%	481	900
						32%	478	927
						28%	3	470
						29%	6	431
						29%	478	780
						31%	511	876
						28%	6	482
						32%	478	744
						29%	472	927
						28%	6	470
						37%	111	332
						38%	294	473
						27%	472	780

HOHCG42	887839	310	HMMER 1.8	PFAM: Ank repeat	PF00023	35%	478	636
HOVCC60	718918	173	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	59.8	371	436
HMVAC92	731732	174	HMMER 2.1.1	PFAM: MAGE family	PF01454	92.6	80	292
HWGAF89	742053	175	HMMER 2.1.1	PFAM: Pumilio-family RNA binding domains (aka PUM-HD, Pumilio homology domain)	PF00806	80	353	457
HHBEG78	969106	176	HMMER 1.8 blastx.2	PFAM: LIM domain containing proteins	PF00412	36.45	166	321
HPMJT61	1152422	177	blastx.2	nebulin-related protein, skeletal muscle - mouse	pir T37192 T37192	80%	151	456
HPMJT61	950367	311	HMMER 2.1.1 blastx.2	BCDNA:GH03482 PROTEIN.	sp Q9V777 Q9V777	46%	2	220
HKAE89	827573	178	HMMER 2.1.1 blastx.2	PFAM: Ank repeat	PF00023	31.7	97	195
				similar to ankyrin of Chromatium vinosum. [Homo sapiens]	dbj BAA11489.1	48%	73	351
				PFAM: Leucine Rich Repeat	PF00560	66.7	205	276
				insulin-like growth factor acid-labile chain - baboon	pir JC5239 JC5239	36%	52	537
						39%	52	396
						35%	52	537
						41%	22	420
						38%	70	402
						37%	43	435
						32%	37	429

HHAMA35	850272	179	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	63%	42	74
HRADJ08	1179715	180	blastx.2	NG28.	sp Q9Z1P7 Q9Z1P7	45.8	438	506
HRADJ08	958556	312	HMMER 2.1.1	PFAM: Ank repeat	PF00023	55%	211	939
			blastx.14	similar to ankyrin of Chromatium vinosum. [Homo sapiens]	gi 1136404 dbj BAA1 1489.1	33.4	437	529
HL YAN64	867366	181	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	88%	200	724
HTLHP64	883120	182	HMMER 2.1.1	PFAM: PWWP domain	PF00855	38.5	825	890
HNTCI60	890754	183	HMMER 2.1.1	PFAM: PWWP domain	PF00855	36.6	248	400
HUCMU74	899751	184	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	68.3	5	226
			blastx.2	hypothetical protein ZC518.3a - Caenorhabditis elegans	pir T27632 T27632	36.4	235	303
HWWT02	908017	185	HMMER 2.1.1	PFAM: B-box zinc finger.	PF00643	50% 65%	82 556	504 678
			blastx.14	(AF156271) RING finger protein terf [Homo sapiens]	gi 5114351 gb AAD4 0286.1	37	615	740
HSKDU47	1154797	186	blastx.2	hypothetical protein DKFZp434N1511.1 - human (fragment)	pir T46316 T46316	43% 60% 35% 75%	612 382 528 502	755 486 611 525
HSKDU47	953264	313	HMMER 2.1.1	PFAM: Ank repeat	PF00023	100%	386	562
						149.2	591	689

blastx.14	ankyrin [Rattus norvegicus]	gi 1841966 gb AAB47551.1	41%	585	758
			35%	6	245
			35%	6	245
			35%	6	245
			37%	6	245
			28%	6	245
			32%	582	776
			30%	6	245
			36%	6	245
			33%	585	764
			33%	597	764
			27%	42	245
			28%	6	245
			29%	6	218
			37%	582	758
			28%	6	245
			34%	600	764
			30%	6	215
			33%	585	764
			28%	6	245
			40%	585	716
			30%	6	245
			32%	585	770
			27%	6	245
			31%	582	764
			32%	600	758
			28%	6	245
			30%	585	764
			30%	579	764
			28%	6	245
			32%	582	764
			30%	600	764

755	585	31%					
353	291	57%					
245	78	28%					
776	600	28%					
245	99	30%					
353	291	57%					
152	6	32%					
764	597	30%					
350	291	55%					
551	441	40%					
455	390	54%					
557	459	36%					
353	291	52%					
353	270	39%					
350	291	50%					
350	276	48%					
350	291	55%					
476	387	46%					
353	291	47%					
449	333	35%					
551	444	33%					
350	291	50%					
350	291	45%					
350	288	47%					
461	369	35%					
353	291	47%					
464	342	34%					
350	291	50%					
455	387	47%					
452	387	50%					
353	276	38%					
473	369	34%					

HODFI03	918008	187	HMMER 2.1.1	PFAM: Pumilio-family RNA binding domains (aka PUM-HD, Pumilio homology domain)	PF00806	52% 33% 42% 31% 33% 38% 33% 42% 42% 45% 38% 44% 39%	297 453 387 444 291 291 270 291 387 597 387 441 585	353 551 464 557 362 353 350 347 449 656 449 527 653
HWHHR02	919169	188	HMMER 2.1.1	PFAM: MSP (Major sperm protein) domain	PF00635	63.9	75	341
			blastx.14	(AF053356) ORF3, splicevariant_b [Homo sapiens]	gi 3135314 gb AAC7 8798.1	83%	96	668
HSVBQ03	924850	189	HMMER 2.1.1	PFAM: Clathrin adaptor complex small chain	PF01217	52.7	77	205
			blastx.14	(AF151878) CGI-120 protein [Homo sapiens]	gi 4929709 gb AAD3 4115.1 AF151878_1	65% 59% 70%	62 270 216	244 350 266

HSLCQ10	1153914	190	blastx.2	DNA-BINDING PROTEIN RFXANK.	sp O14593 RFXK_H UMAN	55%	754	909
HSLCQ10	963625	314	HMMER 2.1.1	PFAM: Ank repeat	PF00023	95.1	924	1022
			blastx.14	(AF094761) Rfxank [Mus musculus]	gi 3820618 gb AAC6 9884.1	66% 56%	882 759	1310 896
HKACQ38	975382	191	blastx.2	LIM protein - rat	pir JC4385 JC4385	38% 44%	718 109	1119 336
HKACQ38	948607	315	HMMER 2.1.1	PFAM: PDZ domain (Also known as DHR or GLGF).	PF00595	60.7	171	413
			blastx.14	(AF053367) carboxyl terminal LIM domain protein [Mus musculus]	gi 2996196 gb AAC0 8436.1	63% 40% 61% 72% 38%	1077 222 798 189 1008	1199 416 890 221 1070
HE9GZ52	964579	192	HMMER 1.8	PFAM: Ank repeat	PF00023	13.7	88	153
			blastx.2	CG8809 PROTEIN.	sp Q9V583 Q9V583	36%	4	402
HSYBD55	1197348	193	blastx.2	HYPOTHETICAL 92.9 KDA PROTEIN.	sp Q9Y2V6 Q9Y2V6	67% 97% 37% 33% 28% 30% 26% 29% 35%	45 383 63 63 63 63 63 63 126	632 499 239 239 416 242 233 215 197
HSYBD55	863287	316	HMMER 2.1.1	PFAM: Ank repeat	PF00023	42.3	150	248
HTAJM37	1152423	194	blastx.2	hypothetical protein DKFZp434D2328.1 -	pir T42691 T42691	99% 32%	162 9	653 653

HTAJM37	911599	317	HMMER 2.1.1	human (fragment)		35%	63	638
						35%	15	653
						34%	12	629
						33%	27	644
						33%	18	629
						32%	12	605
						28%	3	644
						34%	9	641
						30%	6	611
						29%	60	641
						29%	126	644
						29%	81	569
						38%	9	368
						135	551	649
HTAJM37	911599	317	HMMER 2.1.1	PFAM: Ank repeat	PF00023			
HSDJH63	941120	195	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	46.8	258	329
			blastx.2	Toll-like receptor 2 [Homo sapiens]	gb AAC34133.1	30%	180	1193
						38%	32	85
HNNAG23	967549	318	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	53.96	375	548
			blastx.14	mutant sterol regulatory element binding protein-2 1	gi 841318 gb AAA85 718.1	70%	354	575
						40%	569	628
						45%	277	309
						33%	226	288
HYAAL21	943135	197	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	37	449	517
			blastx.2	Leucine-rich-repeat protein lrrA.	sp AAF66828 AAF66 828	30%	224	784
						27%	212	802
						27%	308	754
						30%	120	314
HPBCF69	946469	198	HMMER	PFAM: Leucine Rich	PF00560	61.9	448	377

HWD4E40	947007	199	2.1.1	Repeat	gb AAD26567.1 AF1 26540_1	37% 31% 32%	21 39 385	431 431 477
			blastx.2	(AF126540) slit protein [Drosophila melanogaster]				
			HMMER 2.1.1	PFAM: Leucine Rich Repeat				
HUVHH77	948377	200	blastx.2	SLIT2.	sp Q9WUG5 Q9WU G5	33% 33% 32% 26% 29% 30% 26% 30% 31% 34% 29% 28% 29% 29% 30% 32% 29% 26% 34% 27% 28% 31% 26% 37%	250 802 769 802 307 250 625 709 709 493 586 421 901 781 499 604 409 493 625 724 748 280 355 349	804 1332 1335 1701 1161 726 1092 1167 1086 906 1020 870 1344 1161 873 939 798 948 933 1086 1020 540 654 513
			HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	54.6	807	884

				blastx.2	(AF169677) leucine-rich repeat transmembrane protein FLRT3 [Homo sapiens]	gb AAF28461.1 AF169677_1	57%	264	920
HTLIT03	966870	201		HMMER 1.8	PFAM: Double-stranded RNA binding motif	PF00035	15.48	452	646
				blastx.2	CDNA FLJ20399 FIS, CLONE KAT00581.	sp BAA91143 BAA91143	94%	2	823
HUIJA09	951526	202		HMMER 2.1.1	PFAM: MAGE family	PF01454	92.9	273	605
				blastx.14	(AF124440) MAGE tumor antigen D1 [Homo sapiens]	gi 4877759 gb AAD31421.1 AF124440_1	91%	228	599
							100%	718	741
HTEPU67	1152262	203		blastx.2	CG10011 PROTEIN.	sp Q9VAU5 Q9VAU5	49%	20	355
							44%	23	406
							34%	29	562
							39%	14	358
							38%	14	364
							31%	23	457
							35%	23	379
							35%	11	379
							36%	14	355
							34%	23	346
							35%	23	346
HTEPU67	948288	319		HMMER 2.1.1	PFAM: Ank repeat	PF00023	90.7	280	378
				blastx.14	alt. ankyrin (variant 2.2) [Homo sapiens]	gi 747710 emb CAA34611.1	37%	1	459
							33%	10	483
							31%	1	459
							30%	1	456
							33%	1	459
							30%	10	459

HULFJ52	952928	204	HMMER 2.1.1	PFAM: Phosphopantetheine attachment site (AC002400) Acyl carrier protein, Mitochondrial (ACP) (5partial) [Homo sapiens]	PF00550		32%	1	441
							30%	1	459
							30%	1	444
							28%	1	456
							29%	1	453
							27%	31	459
							29%	31	462
							27%	1	456
							33%	1	354
							28%	1	441
							27%	1	441
							28%	76	459
							29%	94	456
							28%	292	459
HTEPV02	917406	320	HMMER 2.1.1	PFAM: Ank repeat	PF00023	gi 2576345 gb AAC0 5814.1	100%	77	559
							30.4	343	435
							41%	247	411
HTHBT91	954878	321	HMMER 2.1.1	PFAM: Domain of unknown function	PF01945	gi 747710 emb CAA3 4611.1	109.4	463	2
							48% 65%	529 181	194 8

HFV16	1164631	207	blastx.2	from t GA-binding protein beta chain form 1 - mouse	pir B40858 B40858	66%	112	993
HFV16	813110	322	HMMER 2.1.1	PFAM: Ank repeat	PF00023	75%	1165	1248
HTJAB35	491273	208	blastx.2	Unnamed portein product.	sp BAB01630 BAB0 1630	43.1	220	318
HTJAB35	880424	324	HMMER 1.8	PFAM: Ank repeat	PF00023	64%	39	299
HRABP94	970481	209	HMMER 1.8	PFAM: LIM domain containing proteins	PF00412	35.64	242	325
			blastx.2	hypothetical protein DKFZp434B1517.1 - human (fragment)	pir T34532 T34532	27.21	321	497
HWAGC08	958139	210	HMMER 2.1.1	PFAM: PWWP domain	PF00855	86%	219	1433
HRDET35	945350	211	HMMER 2.1.1	PFAM: LIM domain containing proteins	PF00412	25.5	244	333
			blastx.2	LIM protein - human	pir JC2324 JC2324	194	381	551
HGBIA24	1153890	212	blastx.2	hypothetical protein DKFZp434D2328.1 - human (fragment)	pir T42691 T42691	86%	81	719
						33%	381	722
						24%	183	722
						73%	13	432
						36%	7	513
						33%	25	495
						31%	13	504
						34%	13	441
						36%	13	462
						35%	13	429
						30%	19	441
HGBIA24	661111	325	HMMER 2.1.1	PFAM: Ank repeat	PF00023	42.7	19	117

HTTHF21	921596	213	HMMER 1.8	PFAM: Ank repeat	PF00023	13.05	327	368
HWHJZ40	964153	214	HMMER 2.1.1	PFAM: Leucine Rich Repeat	PF00560	88	594	671
HJMBN52	966226	215	blastx.2	prolargin [Homo sapiens]	gb AAC18782.1	34%	351	1148
			HMMER 2.1.1	PFAM: Zinc finger C-x8- C-x5-C-x3-H type (and similar).	PF00642	31.6	90	170
HUFCN47	1197927	216	blastx.2	CDNA FLJ20093 FIS, CLONE COL04263.	sp BAA90945 BAA9 0945	99% 95% 33% 29%	687 191 209 518	1484 613 571 628
HUFCN47	910435	326	HMMER 2.1.1	PFAM: Ank repeat	PF00023	71.2	454	546
			blastx.14	contains 10 ankyrin-like repeats; similar to human 1 [Paramecium bursaria Chlorella virus 1]	gi 2447128 gb AAC9 6986.1	41% 45% 37% 40% 40% 37% 34% 51% 43% 51% 37% 38% 33%	337 364 364 364 364 367 349 247 256 256 259 256 256	540 540 540 540 519 543 540 345 345 342 345 348 354
HHEUC31	795268	327	HMMER 2.1.1	PFAM: Ank repeat	PF00023	31.5	3	92
HUSAL47	1197928	218	blastx.2	CG5841 PROTEIN.	sp Q9VUX2 Q9VUX 2	61% 35% 42%	78 177 1023	1322 1268 1601

HUSAL47	911607	328	HMMER 2.1.1	PFAM: Ank repeat	PF00023	28%	177	914
			blastx.14	ankyrin 3 [Mus musculus]	gi 710551 gb AAB01605.1	37%	45	422
						36%	30	410
						32%	39	422
						37%	39	308
						29%	24	404
						31%	18	404
						30%	39	422
						30%	39	404
						29%	39	410
						35%	54	404
						30%	39	404
						28%	30	404
						26%	42	422
						31%	24	401
						31%	108	404
						27%	54	410
						31%	45	404
						30%	57	422
						30%	126	410
						29%	39	404
						27%	165	407
						41%	303	410
						51%	429	521
						38%	429	521
						54%	450	521
						42%	429	512
						44%	447	521

HHFGD38	1153892	219	blastx.2	WUGSC:H_DJ1035O02.1 PROTEIN (FRAGMENT).			44%	447	521
							38%	444	521
							46%	429	512
							37%	432	527
							50%	450	521
							47%	450	518
							43%	432	521
							35%	516	599
							32%	522	605
							32%	429	521
							42%	450	512
							27%	438	545
							39%	444	512
							28%	429	512
							34%	498	575
							29%	411	521
							47%	525	575
							44%	459	512
							32%	516	608
							35%	507	590
HHFGD38	1153892	219	blastx.2	WUGSC:H_DJ1035O02.1 PROTEIN (FRAGMENT).	sp Q9UDM3 Q9UD M3		46%	393	680
HHFGD38	766126	329	HMMER 2.1.1	PFAM: Ank repeat	PF00023		37.1	384	482
HVAOG11	966135	330	HMMER 2.1.1	PFAM: Ank repeat	PF00023		36.8	286	384
HUVDR03	974684	221	HMMER 2.1.1	PFAM: PWWP domain	PF00855		69.5	46	267
HUDAE29	689811	222	HMMER 2.1.1	PFAM: VHS domain	PF00790		59.2	115	267
HIBC189	954681	223	HMMER	PFAM: Ank repeat	PF00023		83.8	960	871

			2.1.1	(AL034408) dJ710L4.2 (similar to MYOTUBULARIN- RELATED PROTEIN) [Homo sapiens]	gi 4490506 emb CAB 38778.1	98%	1791	1204
HIBCJ89	963279	331	HMMER 2.1.1	PFAM: Ank repeat	PF00023	83.8	982	1071
			blastx.14	(AL034408) dJ710L4.2 (similar to MYOTUBULARIN- RELATED PROTEIN) [Homo sapiens]	gi 4490506 emb CAB 38778.1	99%	151	738
HIBEG40	504158	224	HMMER 2.1.1	PFAM: Ank repeat	PF00023	36.5	206	304
HWBEG33	1195806	225	blastx.2	hypothetical protein DKFZp586M2121.1 - human (fragment)	pir T46507 T46507	99%	114	1784
HWBEG33	702070	332	HMMER 2.1.1	PFAM: Ank repeat	PF00023	34	388	486
HWHKD22	1150878	226	blastx.2	RFXANK.	sp Q9Z205 Q9Z205	73%	15	308
HWHKD22	963626	333	HMMER 2.1.1	PFAM: Ank repeat	PF00023	55.2	308	406
			blastx.14	(AF094761) Rfxank [Mus musculus]	gi 3820618 gb AAC6 9884.1	72%	182	499
HSLFO41	765497	227	HMMER 2.1.1	PFAM: Molybdenum cofactor biosynthesis protein	PF00994	139.6	1	249
HE9SE46	944511	228	HMMER 1.8	PFAM: Low-density lipoprotein receptor domain class A	PF00057	37.51	508	621

			blastx.2	HEPATOCYTE GROWTH FACTOR ACTIVATOR INHIBITOR.	sp O43278 O43278	33%	61	504
HTLDW37	864276	229	HMMER 2.1.1	PFAM: START domain	PF01852	141.6	499	651
HWAFG54	1227138	230	blastx.2	GTPase-activating protein rhoGAP - human (fragment)	pir A49678 A49678	31%	484	558
HWAFG54	1056330	334	blastx.14	SH3 domain binding protein [Mus musculus]	gi 861029 emb CAA6 1011.1	31%	597	869
						35%	462	563
						37%	1793	1897
						47%	2199	2249
						43%	303	371
						53%	1519	1563
HKAFS73	810433	231	HMMER 2.1.1	PFAM: Ank repeat	PF00023	43.4	219	281
			blastx.2	hypothetical protein DKFZp564L0862.1 - human (fragment)	pir T12477 T12477	43%	6	410
						34%	6	383
						40%	93	344
HTXJD74	921175	232	HMMER 2.1.1	PFAM: START domain	PF01852	172.9	138	749
			blastx.2	PHOSPHATIDYLCHOLI NE TRANSFER PROTEIN.	sp Q9UKL6 Q9UKL6	100%	111	752
HSIGQ50	932448	233	HMMER 2.1.1	PFAM: Domain in Myosin and Kinesin Tails	PF00784	90.8	349	669
			blastx.14	Similarity to myosin; cDNA EST yk249a4.5 comes from 1 1 gene; cDNA EST yk470b4.5 comes from this gene;	gi 3877186 emb CAA 91469.1	45%	922	1020
						36%	454	561
						24%	289	549
						32%	289	399
						56%	376	450

				cDNA EST yk249a4		25%	733	906
						27%	565	726
						56%	115	162
						25%	40	159
						47%	95	145
HWWDY45	932607	234	HMMER 2.1.1 blastx.2	PFAM: GTP1/OBG family conserved hypothetical protein - Thermotoga maritima (strain MSB8)	PF01018 pir B72418 B72418	84.8%	411	575
						44%	201	596
						44%	619	726
						38%	51	104
HNSMB24	971537	235	HMMER 1.8 blastx.2	PFAM: Trypsin MOSAIC SERINE PROTEASE EPITHELIALIN.	PF00089 sp Q9QY82 Q9QY82	74.77%	405	578
						40%	33	677
						75	679	464
HWLOU63	946862	236	HMMER 2.1.1 blastx.14	PFAM: Glucose inhibited division protein A (AF132937) CGI-02 protein [Homo sapiens]	PF01134 gi 4680645 gb AAD2 7712.1 AF132937 1	99%	691	383
						69%	719	681

[44] Table 2 further characterizes certain encoded polypeptides of the invention, by providing the results of comparisons to protein and protein family databases. The first column provides a unique clone identifier, "Clone ID NO:", corresponding to a cDNA clone disclosed in Table 1A. The second column provides the unique contig identifier, "Contig ID:" which allows correlation with the information in Table 1A. The third column provides the sequence identifier, "SEQ ID NO:", for the contig polynucleotide sequences. The fourth column provides the analysis method by which the homology/identity disclosed in the Table was determined. The fifth column provides a description of the PFAM/NR hit identified by each analysis. Column six provides the accession number of the PFAM/NR hit disclosed in the fifth column. Column seven, score/percent identity, provides a quality score or the percent identity, of the hit disclosed in column five. Comparisons were made between polypeptides encoded by polynucleotides of the invention and a non-redundant protein database (herein referred to as "NR"), or a database of protein families (herein referred to as "PFAM"), as described below.

[45] The NR database, which comprises the NBRF PIR database, the NCBI GenPept database, and the SIB SwissProt and TrEMBL databases, was made non-redundant using the computer program nrdb2 (Warren Gish, Washington University in Saint Louis). Each of the polynucleotides shown in Table 1A, column 3 (e.g., SEQ ID NO:X or the 'Query' sequence) was used to search against the NR database. The computer program BLASTX was used to compare a 6-frame translation of the Query sequence to the NR database (for information about the BLASTX algorithm please see Altshul et al., J. Mol. Biol. 215:403-410 (1990); and Gish and States, Nat. Genet. 3:266-272 (1993). A description of the sequence that is most similar to the Query sequence (the highest scoring 'Subject') is shown in column five of Table 2 and the database accession number for that sequence is provided in column six. The highest scoring 'Subject' is reported in Table 2 if (a) the estimated probability that the match occurred by chance alone is less than $1.0\text{e-}07$, and (b) the match was not to a known repetitive element. BLASTX returns alignments of short polypeptide segments of the Query and Subject sequences which share a high degree of similarity; these segments are known as High-Scoring Segment Pairs or HSPs. Table 2 reports the degree of similarity between the Query and the Subject for each HSP as a percent identity in Column 7. The percent identity is determined by dividing the number of exact matches between the two aligned sequences in the HSP, dividing by the number of Query amino acids in the HSP

and multiplying by 100. The polynucleotides of SEQ ID NO:X which encode the polypeptide sequence that generates an HSP are delineated by columns 8 and 9 of Table 2.

[46] The PFAM database, PFAM version 2.1, (Sonnhammer et al., Nucl. Acids Res., 26:320-322, 1998)) consists of a series of multiple sequence alignments; one alignment for each protein family. Each multiple sequence alignment is converted into a probability model called a Hidden Markov Model, or HMM, that represents the position-specific variation among the sequences that make up the multiple sequence alignment (see, e.g., Durbin et al., *Biological sequence analysis: probabilistic models of proteins and nucleic acids*, Cambridge University Press, 1998 for the theory of HMMs). The program HMMER version 1.8 (Sean Eddy, Washington University in Saint Louis) was used to compare the predicted protein sequence for each Query sequence (SEQ ID NO:Y in Table 1A) to each of the HMMs derived from PFAM version 2.1. A HMM derived from PFAM version 2.1 was said to be a significant match to a polypeptide of the invention if the score returned by HMMER 1.8 was greater than 0.8 times the HMMER 1.8 score obtained with the most distantly related known member of that protein family. The description of the PFAM family which shares a significant match with a polypeptide of the invention is listed in column 5 of Table 2, and the database accession number of the PFAM hit is provided in column 6. Column 7 provides the score returned by HMMER version 1.8 for the alignment. Columns 8 and 9 delineate the polynucleotides of SEQ ID NO:X which encode the polypeptide sequence which show a significant match to a PFAM protein family.

[47] As mentioned, columns 8 and 9 in Table 2, "NT From" and "NT To", delineate the polynucleotides of "SEQ ID NO:X" that encode a polypeptide having a significant match to the PFAM/NR database as disclosed in the fifth column. In one embodiment, the invention provides a protein comprising, or alternatively consisting of, a polypeptide encoded by the polynucleotides of SEQ ID NO:X delineated in columns 8 and 9 of Table 2. Also provided are polynucleotides encoding such proteins, and the complementary strand thereto.

[48] The nucleotide sequence SEQ ID NO:X and the translated SEQ ID NO:Y are sufficiently accurate and otherwise suitable for a variety of uses well known in the art and described further below. For instance, the nucleotide sequences of SEQ ID NO:X are useful for designing nucleic acid hybridization probes that will detect nucleic acid sequences contained in SEQ ID NO:X or the cDNA contained in Clone ID NO:Z. These probes will also hybridize to nucleic acid molecules in biological samples, thereby enabling

immediate applications in chromosome mapping, linkage analysis, tissue identification and/or typing, and a variety of forensic and diagnostic methods of the invention. Similarly, polypeptides identified from SEQ ID NO:Y may be used to generate antibodies which bind specifically to these polypeptides, or fragments thereof, and/or to the polypeptides encoded by the cDNA clones identified in, for example, Table 1A.

[49] Nevertheless, DNA sequences generated by sequencing reactions can contain sequencing errors. The errors exist as misidentified nucleotides, or as insertions or deletions of nucleotides in the generated DNA sequence. The erroneously inserted or deleted nucleotides cause frame shifts in the reading frames of the predicted amino acid sequence. In these cases, the predicted amino acid sequence diverges from the actual amino acid sequence, even though the generated DNA sequence may be greater than 99.9% identical to the actual DNA sequence (for example, one base insertion or deletion in an open reading frame of over 1000 bases).

[50] Accordingly, for those applications requiring precision in the nucleotide sequence or the amino acid sequence, the present invention provides not only the generated nucleotide sequence identified as SEQ ID NO:X, and a predicted translated amino acid sequence identified as SEQ ID NO:Y, but also a sample of plasmid DNA containing cDNA Clone ID NO:Z (deposited with the ATCC on October 5, 2000, and receiving ATCC designation numbers PTA 2574 and PTA 2575; deposited with the ATCC on January 5, 2001, and having depositor reference numbers TS-1, TS-2, AC-1, and AC-2; and/or as set forth, for example, in Table 1A, 6 and 7). The nucleotide sequence of each deposited clone can readily be determined by sequencing the deposited clone in accordance with known methods. Further, techniques known in the art can be used to verify the nucleotide sequences of SEQ ID NO:X.

[51] The predicted amino acid sequence can then be verified from such deposits. Moreover, the amino acid sequence of the protein encoded by a particular clone can also be directly determined by peptide sequencing or by expressing the protein in a suitable host cell containing the deposited human cDNA, collecting the protein, and determining its sequence.

RACE Protocol For Recovery of Full-Length Genes

[52] Partial cDNA clones can be made full-length by utilizing the rapid amplification of cDNA ends (RACE) procedure described in Frohman, M.A., et al., Proc. Nat'l. Acad.

Sci. USA, 85:8998-9002 (1988). A cDNA clone missing either the 5' or 3' end can be reconstructed to include the absent base pairs extending to the translational start or stop codon, respectively. In some cases, cDNAs are missing the start codon of translation, therefor. The following briefly describes a modification of this original 5' RACE procedure. Poly A⁺ or total RNA is reverse transcribed with Superscript II (Gibco/BRL) and an antisense or complementary primer specific to the cDNA sequence. The primer is removed from the reaction with a Microcon Concentrator (Amicon). The first-strand cDNA is then tailed with dATP and terminal deoxynucleotide transferase (Gibco/BRL). Thus, an anchor sequence is produced which is needed for PCR amplification. The second strand is synthesized from the dA-tail in PCR buffer, Taq DNA polymerase (Perkin-Elmer Cetus), an oligo-dT primer containing three adjacent restriction sites (XhoI, SalI and ClaI) at the 5' end and a primer containing just these restriction sites. This double-stranded cDNA is PCR amplified for 40 cycles with the same primers as well as a nested cDNA-specific antisense primer. The PCR products are size-separated on an ethidium bromide-agarose gel and the region of gel containing cDNA products the predicted size of missing protein-coding DNA is removed. cDNA is purified from the agarose with the Magic PCR Prep kit (Promega), restriction digested with XhoI or SalI, and ligated to a plasmid such as pBluescript SKII (Stratagene) at XhoI and EcoRV sites. This DNA is transformed into bacteria and the plasmid clones sequenced to identify the correct protein-coding inserts. Correct 5' ends are confirmed by comparing this sequence with the putatively identified homologue and overlap with the partial cDNA clone. Similar methods known in the art and/or commercial kits are used to amplify and recover 3' ends.

[53] Several quality-controlled kits are commercially available for purchase. Similar reagents and methods to those above are supplied in kit form from Gibco/BRL for both 5' and 3' RACE for recovery of full length genes. A second kit is available from Clontech which is a modification of a related technique, SLIC (single-stranded ligation to single-stranded cDNA), developed by Dumas et al., *Nucleic Acids Res.*, 19:5227-32 (1991). The major differences in procedure are that the RNA is alkaline hydrolyzed after reverse transcription and RNA ligase is used to join a restriction site-containing anchor primer to the first-strand cDNA. This obviates the necessity for the dA-tailing reaction which results in a polyT stretch that is difficult to sequence past.

[54] An alternative to generating 5' or 3' cDNA from RNA is to use cDNA library double-stranded DNA. An asymmetric PCR-amplified antisense cDNA strand is

synthesized with an antisense cDNA-specific primer and a plasmid-anchored primer. These primers are removed and a symmetric PCR reaction is performed with a nested cDNA-specific antisense primer and the plasmid-anchored primer.

RNA Ligase Protocol For Generating The 5' or 3' End Sequences To Obtain Full Length Genes

[55] Once a gene of interest is identified, several methods are available for the identification of the 5' or 3' portions of the gene which may not be present in the original cDNA plasmid. These methods include, but are not limited to, filter probing, clone enrichment using specific probes and protocols similar and identical to 5' and 3' RACE. While the full length gene may be present in the library and can be identified by probing, a useful method for generating the 5' or 3' end is to use the existing sequence information from the original cDNA to generate the missing information. A method similar to 5' RACE is available for generating the missing 5' end of a desired full-length gene. (This method was published by Fromont-Racine et al., Nucleic Acids Res., 21(7):1683-1684 (1993)). Briefly, a specific RNA oligonucleotide is ligated to the 5' ends of a population of RNA presumably containing full-length gene RNA transcript and a primer set containing a primer specific to the ligated RNA oligonucleotide and a primer specific to a known sequence of the gene of interest, is used to PCR amplify the 5' portion of the desired full length gene which may then be sequenced and used to generate the full length gene. This method starts with total RNA isolated from the desired source, poly A RNA may be used but is not a prerequisite for this procedure. The RNA preparation may then be treated with phosphatase if necessary to eliminate 5' phosphate groups on degraded or damaged RNA which may interfere with the later RNA ligase step. The phosphatase if used is then inactivated and the RNA is treated with tobacco acid pyrophosphatase in order to remove the cap structure present at the 5' ends of messenger RNAs. This reaction leaves a 5' phosphate group at the 5' end of the cap cleaved RNA which can then be ligated to an RNA oligonucleotide using T4 RNA ligase. This modified RNA preparation can then be used as a template for first strand cDNA synthesis using a gene specific oligonucleotide. The first strand synthesis reaction can then be used as a template for PCR amplification of the desired 5' end using a primer specific to the ligated RNA oligonucleotide and a primer specific to the known sequence of the gene of interest. The resultant product is then sequenced and analyzed to confirm that the 5' end sequence belongs to the relevant gene.

[56] The present invention also relates to vectors or plasmids which include such DNA sequences, as well as the use of the DNA sequences. The material deposited with the ATCC (deposited with the ATCC on October 5, 2000, and receiving ATCC designation numbers PTA 2574 and PTA 2575; deposited with the ATCC on January 5, 2001, and receiving ATCC designation numbers TS-1, TS-2, AC-1, and AC-2; and/or as set forth, for example, in Table 1A, Table 6, or Table 7) is a mixture of cDNA clones derived from a variety of human tissue and cloned in either a plasmid vector or a phage vector, as described, for example, in Table 7. These deposits are referred to as "the deposits" herein. The tissues from which some of the clones were derived are listed in Table 7, and the vector in which the corresponding cDNA is contained is also indicated in Table 7. The deposited material includes cDNA clones corresponding to SEQ ID NO:X described, for example, in Table 1A (Clone ID NO:Z). A clone which is isolatable from the ATCC Deposits by use of a sequence listed as SEQ ID NO:X, may include the entire coding region of a human gene or in other cases such clone may include a substantial portion of the coding region of a human gene. Furthermore, although the sequence listing may in some instances list only a portion of the DNA sequence in a clone included in the ATCC Deposits, it is well within the ability of one skilled in the art to sequence the DNA included in a clone contained in the ATCC Deposits by use of a sequence (or portion thereof) described in, for example Tables 1A or 2 by procedures hereinafter further described, and others apparent to those skilled in the art.

[57] Also provided in Table 7 is the name of the vector which contains the cDNA clone. Each vector is routinely used in the art. The following additional information is provided for convenience.

[58] Vectors Lambda Zap (U.S. Patent Nos. 5,128,256 and 5,286,636), Uni-Zap XR (U.S. Patent Nos. 5,128,256 and 5,286,636), Zap Express (U.S. Patent Nos. 5,128,256 and 5,286,636), pBluescript (pBS) (Short, J. M. et al., *Nucleic Acids Res.* 16:7583-7600 (1988); Alting-Mees, M. A. and Short, J. M., *Nucleic Acids Res.* 17:9494 (1989)) and pBK (Alting-Mees, M. A. et al., *Strategies* 5:58-61 (1992)) are commercially available from Stratagene Cloning Systems, Inc., 11011 N. Torrey Pines Road, La Jolla, CA, 92037. pBS contains an ampicillin resistance gene and pBK contains a neomycin resistance gene. Phagemid pBS may be excised from the Lambda Zap and Uni-Zap XR vectors, and phagemid pBK may be excised from the Zap Express vector. Both phagemids may be transformed into *E. coli* strain XL-1 Blue, also available from Stratagene.

[59] Vectors pSport1, pCMVSPORT 1.0, pCMVSPORT 2.0 and pCMVSPORT 3.0, were obtained from Life Technologies, Inc., P. O. Box 6009, Gaithersburg, MD 20897. All Sport vectors contain an ampicillin resistance gene and may be transformed into *E. coli* strain DH10B, also available from Life Technologies. See, for instance, Gruber, C. E., et al., *Focus* 15:59- (1993). Vector lacmid BA (Bento Soares, Columbia University, New York, NY) contains an ampicillin resistance gene and can be transformed into *E. coli* strain XL-1 Blue. Vector pCR[®]2.1, which is available from Invitrogen, 1600 Faraday Avenue, Carlsbad, CA 92008, contains an ampicillin resistance gene and may be transformed into *E. coli* strain DH10B, available from Life Technologies. See, for instance, Clark, J. M., *Nuc. Acids Res.* 16:9677-9686 (1988) and Mead, D. et al., *Bio/Technology* 9: (1991).

[60] The present invention also relates to the genes corresponding to SEQ ID NO:X, SEQ ID NO:Y, and/or the deposited clone (Clone ID NO:Z). The corresponding gene can be isolated in accordance with known methods using the sequence information disclosed herein. Such methods include preparing probes or primers from the disclosed sequence and identifying or amplifying the corresponding gene from appropriate sources of genomic material.

[61] Also provided in the present invention are allelic variants, orthologs, and/or species homologs. Procedures known in the art can be used to obtain full-length genes, allelic variants, splice variants, full-length coding portions, orthologs, and/or species homologs of genes corresponding to SEQ ID NO:X or the complement thereof, polypeptides encoded by genes corresponding to SEQ ID NO:X or the complement thereof, and/or the cDNA contained in Clone ID NO:Z, using information from the sequences disclosed herein or the clones deposited with the ATCC. For example, allelic variants and/or species homologs may be isolated and identified by making suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source for allelic variants and/or the desired homologue.

[62] The polypeptides of the invention can be prepared in any suitable manner. Such polypeptides include isolated naturally occurring polypeptides, recombinantly produced polypeptides, synthetically produced polypeptides, or polypeptides produced by a combination of these methods. Means for preparing such polypeptides are well understood in the art.

[63] The polypeptides may be in the form of the secreted protein, including the mature form, or may be a part of a larger protein, such as a fusion protein (see below). It is often

advantageous to include an additional amino acid sequence which contains secretory or leader sequences, pro-sequences, sequences which aid in purification, such as multiple histidine residues, or an additional sequence for stability during recombinant production.

[64] The polypeptides of the present invention are preferably provided in an isolated form, and preferably are substantially purified. A recombinantly produced version of a polypeptide, including the secreted polypeptide, can be substantially purified using techniques described herein or otherwise known in the art, such as, for example, by the one-step method described in Smith and Johnson, *Gene* 67:31-40 (1988). Polypeptides of the invention also can be purified from natural, synthetic or recombinant sources using techniques described herein or otherwise known in the art, such as, for example, antibodies of the invention raised against the polypeptides of the present invention in methods which are well known in the art.

[65] The present invention provides a polynucleotide comprising, or alternatively consisting of, the nucleic acid sequence of SEQ ID NO:X, and/or the cDNA sequence contained in Clone ID NO:Z. The present invention also provides a polypeptide comprising, or alternatively, consisting of, the polypeptide sequence of SEQ ID NO:Y, a polypeptide encoded by SEQ ID NO:X or a complement thereof, a polypeptide encoded by the cDNA contained in Clone ID NO:Z, and/or the polypeptide sequence encoded by a nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B. Polynucleotides encoding a polypeptide comprising, or alternatively consisting of the polypeptide sequence of SEQ ID NO:Y, a polypeptide encoded by SEQ ID NO:X, a polypeptide encoded by the cDNA contained in Clone ID NO:Z, and/or a polypeptide sequence encoded by a nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B are also encompassed by the invention. The present invention further encompasses a polynucleotide comprising, or alternatively consisting of, the complement of the nucleic acid sequence of SEQ ID NO:X, a nucleic acid sequence encoding a polypeptide encoded by the complement of the nucleic acid sequence of SEQ ID NO:X, and/or the cDNA contained in Clone ID NO:Z.

[66] Moreover, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in Table 1B column 6, or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in Table 1B column 6, or any

combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in Table 1B, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1B, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in Table 1B, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in Table 1B, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

[67] Further, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1), or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1), or any combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1) and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1B, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1) and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated

in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1) and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

[68] Further, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1B which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2), or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in column 6 of Table 1B which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2), or any combination thereof. In further embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1B which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2) and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1B, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1B which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2) and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in column 6 of Table 1B which correspond to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2) and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (See Table 1B, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

[69] Moreover, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in the same row of Table 1B column 6, or any combination thereof. Additional, representative examples of polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in the same row of Table 1B column 6, or any combination thereof. In preferred embodiments, the polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the complementary strand(s) of the sequences delineated in the same row of Table 1B column 6, wherein sequentially delineated sequences in the table (i.e. corresponding to those exons located closest to each other) are directly contiguous in a 5' to 3' orientation. In further embodiments, above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1B, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1B, column 5). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1B, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated in the same row of Table 1B, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[70] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1B, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1B, column 2) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[71] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1), and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A or 1B) or fragments or variants thereof. In preferred embodiments, the delineated sequence(s) and polynucleotide sequence of SEQ ID NO:X correspond to the same Clone ID NO:Z. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[72] In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more of the sequences delineated in the same row of column 6 of Table 1B, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A or 1B) or fragments or variants thereof. In preferred embodiments, the delineated sequence(s) and polynucleotide sequence of SEQ ID NO:X correspond to the same row of column 6 of Table 1B. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[73] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[74] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent

hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[75] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1B are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[76] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1B are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides, are also encompassed by the invention.

[77] In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of another sequence in column 6 are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization

conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[78] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of another sequence in column 6 corresponding to the same Clone ID NO:Z (see Table 1B, column 1) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[79] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, a polynucleotide sequence in which the 3' 10 polynucleotides of one sequence in column 6 corresponding to the same contig sequence identifier SEQ ID NO:X (see Table 1B, column 2) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[80] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of another sequence in column 6 corresponding to the same row are directly contiguous. In preferred embodiments, the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B is directly contiguous with the 5' 10 polynucleotides of the next

sequential exon delineated in Table 1B, column 6. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[81] Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. Accordingly, for each contig sequence (SEQ ID NO:X) listed in the fourth column of Table 1A, preferably excluded are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 and the final nucleotide minus 15 of SEQ ID NO:X, b is an integer of 15 to the final nucleotide of SEQ ID NO:X, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:X, and where b is greater than or equal to a + 14. More specifically, preferably excluded are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a and b are integers as defined in columns 4 and 5, respectively, of Table 3. In specific embodiments, the polynucleotides of the invention do not consist of at least one, two, three, four, five, ten, or more of the specific polynucleotide sequences referenced by the Genbank Accession No. as disclosed in column 6 of Table 3 (including for example, published sequence in connection with a particular BAC clone). In further embodiments, preferably excluded from the invention are the specific polynucleotide sequence(s) contained in the clones corresponding to at least one, two, three, four, five, ten, or more of the available material having the accession numbers identified in the sixth column of this Table (including for example, the actual sequence contained in an identified BAC clone). In no way is this listing meant to encompass all of the sequences which may be excluded by the general formula, it is just a representative example. All references available through these accessions are hereby incorporated by reference in their entirety.

TABLE 3

Clone ID NO: Z	SEQ ID NO: X	Contig ID:	EST Disclaimer		Accession #'s
			Range of a	Range of b	
HFRBN59	11	1106393	1 - 432	15 - 446	
HE2KJ64	12	906019	1 - 913	15 - 927	AA164661, AI962647, AA164645, AA096157, T77033, AI656439, T69166, Z44826, R55232, AA164782, AA496160, AA247800, AA091213, AC020570, and AC020570.
HAGDV32	13	1178626	1 - 1889	15 - 1903	AL049128, AA398117, R54194, AA394218, AA081522, AA247129, and AF061936.
HLICC37	14	856958	1 - 624	15 - 638	AA203242, AL365356, AL365356, and AL365356.
HBGBU96	15	1121900	1 - 649	15 - 663	
HAJCQ63	16	823850	1 - 777	15 - 791	AA902808, AI002049, AF082556, and AF082557.
HLMMV66	17	1153903	1 - 738	15 - 752	AW084519, AI244442, AA614014, AI808637, AA903338, AI342240, AI962752, AI717991, AW139714, AI921541, AI660761, D20168, AW138271, AI219797, AI041118, F19235, AI798637, F16699, AI201892, T29020, AI792451, AI054048, AW393736, AW393737, AA748165, AA918804, AA811883, AW271140, AW207518, AA525796, AW393733, and D30758.
HLWAR08	18	1096389	1 - 519	15 - 533	AA078617, AJ133128, and AF160798.
HBGTT76	19	1152327	1 - 816	15 - 830	AI284640, AL046409, AW419262, AI963720, AI613280, AW193265, AI431303, AI305766, AI801482, AI334443, AA581903, AL119691, AI345654, AI270117, AI281881, AA587604, AW327868, AL037683, AW439558, AI708009, AL045053, AW303196, AI133164, AW274349, AW301350, AL041690, AW408717, AI110770, AA569471, AL046205, AA610491, AI076616, AL138455, AW021583, AI754253, AW265393, AL138265, AW276827, AI312309, AW028429, AA491814, AI350211, AL044940, AA490183, AI754658, AA526787, AI064864, AW238278, AI696962, AA720702, AW438643, AI799642, AI270559, F36273, AA521323, AI345681, AI345675, AI610159, AI969436, AA394271, AI679782, AL042753, AI469968, AW088846, AI619997, AA468022, AI064952, AW406162, AI754336, AI305547, AI341664, AW268300, AI623720, AI473943, AI345518, AA164251, AA521399, AI149478, AI798473, AW265009, AW407578, AI192631, AI289067, AI133102, AI633390, AI368256, AI471481, AI249997, AA491284, AA613345, AI821271, AI061334, AW083402, AI732865, AW004911, AW270270, AW073470, AI688846, AL079645, AW410400, AA857486, AI871722, AW029038, AA584201, AI570261, AI355206, AW302013, AW193432, AA533333,

					AI053672, AW162049, AI962050, AI345157, AI929531, AI307201, AA649642, AI801591, AI624142, AW103758, AI744995, AW148792, AW021207, AA551552, AI375710, AA126051, AA126035, AL134972, AW304584, AW131249, AI370094, AI339850, AA507824, H71429, AI379719, AI801600, AW338086, AI344844, AI298710, AW301809, AI559705, AA468131, AI370074, AL038785, AI567076, AA846935, AI805363, AI340453, AI457397, AA877817, AW167372, AI499503, AA623002, AI246119, AI696955, AI286356, AI246796, AA610271, AI792287, AI653886, AA503258, AW261871, AI368745, AA847499, AI376100, AL042853, AW410354, AI921649, AI281697, AI053790, AA584145, AL120687, AA533036, AI587565, AA587256, AI538433, AA713815, AA621858, C75026, AL046457, AL048626, AI564496, AA488746, AI085719, AI358571, AI499134, AL038703, AW339568, AL121235, AW166815, AI623898, AI148277, AA493471, AA631507, AA503473, R24887, AL135405, AW269488, AW276435, AL038705, AA703820, AL038474, AA780515, AA502155, AI674873, AI635818, AI499938, AI625244, AI688928, AI538852, AI357288, AA806796, AA758934, AI890918, AI918421, AI017415, AA084070, AI281903, AI860020, AW406447, AA491831, AL009179, AP000513, D83989, AF015147, AF077058, AC006138, M37551, AF015151, X75335, U57006, U57007, AF015149, AF015156, AF015157, U18394, X54180, U18391, U18392, X55925, U57005, X54176, U57009, U18396, Z97205, X54181, X54178, X53550, U18395, U57008, AL096775, I51997, U18393, AL022238, X55926, U18399, Z97200, Z70688, AJ229041, AF015148, X54175, X55931, X55924, U18387, AC006251, AC005251, X54179, U18390, AL034419, AC005486, AC008249, AF015153, U67221, Z98742, U18398, U67801, AC005914, AP000455, AC002526, AL035455, AL049829, AC006476, AC003102, AC005211, AC004477, X55923, AC004895, AL021392, AL050342, AC005962, AC004217, AC005154, AC005180, AC005859, AL110292, X55927, AF134726, AF027390, AC010175, AC006004, AC004890, U18400, AC004234, X74558, AL049795, U91326, AL132985, U67231, AC005144, AC005921, AC007226, AC005005, AC010197, AC010200, AF015160, AC005829, AC005296, AF085913, X55922, Z22650, AC005664, AL031257, X55932, AC006511, AC016026, S43650, U12580, AC007043, AL022163, AC006088, AC004987, AC007682, U67233,
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HMCFO24	20	924647	1 - 572	15 - 586	AA354491, and AL133087.
HBIOM94	21	973137	1 - 1128	15 - 1142	AW369756, AW062278, AA452837, AA452978, AI767361, AI005282, AI263850, AW016065, N62955, AA514551, AI674818, and AA885328.
HBJLR11	22	1012465	1 - 1055	15 - 1069	AW406595, AW407230, AW405242, AW406935, W75960, AA280941, AW404229, AI127571, AI083668, AI762839, AI479026, AI880750, AI659971, AI418465, AI871470, AI401511, AI884848, AA744459, AA744457, AI033897, AA744029, and AI814201.
HLTER04	23	590990	1 - 1602	15 - 1616	AI080277, AI985856, AI811944, AI792263, AA503208, AA947957, H39200, AI222195, AI078373, N40065, AI572864, AA612717, AI159887, AW136999, W76131, AA724067, AI219932, AA677397, R54201, R54208, AW195855, R12887, AA364711, AA923230, F06179, W72906, AI818758, AA853060, AA853062, AA765276, H99593, AI885955, AA669080, AA853061, AA361288,

					AA853065, R18216, AA853063, AA853064, R42154, AI608615, AA382148, AA336625, AW192034, AA036871, T95989, R41281, F02451, AI207644, AL121330, M61984, H39201, AA307662, AI908083, AA525750, AI198566, AW197911, AA036872, H38407, AA868442, AI215851, AA508495, AA410479, AI697792, AI125914, AI457418, Y13350, AJ001309, AF011793, AB028853, U95727, AF088046, AL035079, AC007338, AC007338, AC018845, and AC018845.
HMSMU30	24	1050601	1 - 609	15 - 623	AA374213, AW088077, AA346367, and AA346368.
H2MBY83	25	752124	1 - 517	15 - 531	AI203647, W44356, AA757210, AI193047, AA524479, AI130814, AI344478, AA582236, AA316493, AI288858, AI146994, AI148643, AA730161, W45709, AI168644, AA927666, AI750017, AA453739, AA491660, AA453820, AA557746, AA652628, AI685002, AI141208, AI190610, AI610804, AA490862, AI859485, AA025400, AI475353, AA346812, AA300676, AI859458, AA356638, AC017104, and AC017104.
HBUAH93	26	1164739	1 - 1614	15 - 1628	AA247840, R93421, R06351, R06293, AB023163, AF161412, and AF049612.
HMZAD58	27	975304	1 - 3341	15 - 3355	N26584, W94986, N38905, AI075815, AI367921, AI184158, AA830019, AI033601, N54995, AA830021, N27197, AA918808, AI539580, AI273730, AI262545, AA587088, AA779942, AA262747, AA676908, AA730411, W86602, H16056, AA287348, AA303482, AW179318, W91912, AA670033, AA705754, AW300038, AA887595, AA703588, AL038837, AL039074, AL037051, AL036725, AL039564, AL039108, AL039156, AL039085, AL039659, AL039109, AL039625, AL039648, AL039128, AL038531, AL039629, AL039678, AL039150, N46479, AL045337, AL040992, AI219099, AL037726, AL039423, AL042909, AL039410, AL045353, AL036973, AL044407, AA312749, AL039538, AL039924, AL039386, AL037526, AL037639, AL038821, AL036196, AL044530, Z99396, AL038851, AL037615, AL037082, AL036418, AL039566, AL036924, AL038025, AL036767, AL036190, AL043441, AL043445, AL039509, AA903850, AL036238, AL036117, AL036679, AL045341, T24119, AL036733, T24112, H00069, AL043422, T23947, AL045794, AL043423, AL037601, AL037027, AL037178, AL036191, AI535783, AW013814, R47228, AW452756, AL037054, AI535983, AL036158, D80253, AW451070, AL036998, AL036964, T23659, AL036858, AL036765, D51250, AL037077, AA495756, AL037177, D59787, AL036174, D59275,

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HCHNH17	28	975378	1 - 1008	15 - 1022	AW340658, AI830575, AI970997, AI375239, AI955746, W52045, AA452348, AA505698, AA452125, AW403701, AI742513, AI199971, AI338181, AI338219, AA926692, AA938400, AA644138, AW402946, AI344126, AI186703, AI183773, AI675706, AA156689, AI300753, AA884026, W60021, W38892, N95054, AI148098, H01993, AA954291, W44927, AI751818, AA805553, AW170013, W39574, AW150567, AI864148, AA280408, AI494112, H04586, R27968, AI193848, AI078102, AI936538, H39712, AI198333, AA194406, AA094826, H02089, AA363376, AA642334, R28221, T94680, AI373118, AA280407, AA994085, AI352072, H13826, AI818830, AA918331, AA554306, AI093632, AI276589, AA447655, AI273430, N30561, H28693, AA134664, AI278504, AW341382, H13182, AI934888, W24049, H13867, AA919107, AF169284, and AC026236.
HBWAJ55	29	802098	1 - 50	15 - 64	
HNJCE31	30	1152346	1 - 1252	15 - 1266	AI018173, AI760388, AW300938, AI199891, AI933017, AI346277, AI951521, AI274896, AI347966, AA668791, AA782661, AI026785, AW405280, AI001012, AA458453, H40863, AI589680, T68710, AA824434, M78791, AA303076, AA280313, AA303075, AA280557, AA897610, AI222091, AW167599, AI971179, AB032972, AF156777, and AF155352.
HKAIU14	31	919538	1 - 1564	15 - 1578	AA452443, AA748492, AA281066, AI038581, AI042300, AA448716, AA588218, W24345, T74435, N95542, AA448626, AA603589, AA243343, AA452281, AA824559, AA371584, T50615, AA243539, F12392, AI524537, AA281191, T50481, F10009, AI004187, AA810738, R14413, AW385047, T63277, C01253, AA876044, and AI557234.
HCE4I12	32	911586	1 - 382	15 - 396	AA013102.
HFOYI18	33	926488	1 - 984	15 - 998	AI655769, AI056895, AI808132, AA056028,

					AI333033, AI373246, AI982973, AA352349, AI918693, AA324259, AI369511, AW026758, AA662463, AA767509, AA056046, AI417153, and AA226846.
HHEDM89	34	945055	1 - 1066	15 - 1080	AL120995, AA599042, and AL109865.
HFXXW18	35	945288	1 - 2324	15 - 2338	T19088, T03269, AI905856, AW178893, D58283, D59859, AW179328, AW177440, D80022, C14331, D80166, D80195, D80193, D59927, D59467, D51423, D59619, D80210, D51799, D80391, D80164, D59275, D80240, D80253, D80043, D59787, D80227, D59502, D81030, D80212, D80196, D80188, D80219, AA305409, C15076, AW378532, D80269, D57483, D80038, D80366, C14429, D50979, D50995, D59889, C14389, D80024, D59610, D80378, AW178775, AW352117, AW178762, D80045, D80241, AW177501, D51060, AW177511, D80134, AW366296, AW352158, D51022, D51097, C14014, AW360811, C75259, AW176467, AW375405, AA305578, AW377672, AW377671, D80251, AW360844, AW360817, D81026, AW375406, D80248, AW378534, AW179332, AW179023, AW178905, AA514188, D58253, D80522, AW352171, AW377676, AW352170, AW177731, AW178907, D80132, AW179019, AW179024, AA514186, D80133, AW178906, AW378528, AW177505, AW179020, AW178909, AW177456, AW179329, AW178980, AW177733, AW178908, AW178754, AW179018, AW178911, D80268, AW179004, AW178914, AA553357, AW367967, D80302, AW178774, AW352174, AW177723, D80439, D80247, T48593, AW178983, D51103, AW378533, AW367950, AI535850, C14975, AW178986, C06015, D45260, X82626, A84916, A67220, D89785, A62300, A62298, Y17188, A78862, D34614, D26022, D88547, AJ132110, AR018138, X67155, A25909, AR025207, AB012117, AF058696, Y12724, AR008278, A85396, I19525, AR066482, A44171, A85477, AB028859, A86792, X93549, A94995, D88507, AR008443, I18367, I50126, I50132, I50128, I50133, AR066488, AF135125, A82595, U87250, AR016514, D50010, AR060138, A45456, A26615, AR052274, AR066490, D13509, Y09669, AR060385, AB033111, AB002449, AR066487, U87247, A43192, A43190, AR038669, A30438, AB023656, AR008408, X93535, AR060133, U79457, and AR008382.
HBIMF04	36	951601	1 - 1385	15 - 1399	AI922958, AI972432, AW391908, AI922949, AI961967, AA568658, AA484955, AW207083, AW139687, AW296274, AW195438, H55661, AW294860, R87853, AL119220, H61275, H52133, H38451, H52024, R90897, R87771, R87761, R88865, R87838, AL022328, AL022328, AL022328,

					and AL022328.
HEEAU28	37	912280	1 - 708	15 - 722	
HDPKI66	38	823854	1 - 1421	15 - 1435	AW207698, AA927827, AA931212, AW183281, AB033075, AF112886, AF075461, U92478, and AF075462.
HOCQD08	39	972981	1 - 701	15 - 715	AA314782, AA121597, AW179125, AA307196, AW410914, AA315619, AA151174, AA221000, F12658, AA205790, AA148973, W42974, T74241, AA353399, AA209384, AA385968, AA421728, AA377635, N40506, W44995, AA339272, AA249242, W07625, W05068, AB026125, AC018568, and AC018568.
HDPRP54	40	1228283	1 - 2443	15 - 2457	AI392846, AI565035, AA430988, AA811609, AI754385, AA130556, AW268863, AA906509, AI698734, AW007245, AI092244, AW118314, AA337522, AA383461, AI537049, AA861761, AA782718, AA130593, AA928445, AW050550, AW438768, AA459681, D63077, AW273355, N51495, AI698391, AI621341, AI699823, AW051088, AI610446, AI270183, AI590043, AI866090, AW022682, AI277008, AI583578, AI537187, AI554821, AI802695, AI670015, AI612913, AI587156, AI624293, AI468872, AI696570, AI247193, AI589428, AI500514, AI685517, AI537677, AI432570, AI613038, AW192687, AI571439, AI800341, AW020397, AL042944, AI538850, AW132107, AI564290, AI445620, AI623941, AI687568, AW410259, AI802542, AI884459, AI434731, AI927233, AW172982, AI540674, AI889189, AI445611, AL046466, AW170725, AW129616, AW089233, AW007555, AI249389, AI446046, AI628325, AW023338, AA916133, AI679550, AI798456, AI289310, AI819014, AW087199, AW080746, AI567769, AI670009, AI433157, AI702073, AI690748, AI590423, AA806757, AW129659, AW128834, AW089844, AI633125, AI591228, AW079572, AI538564, AW006032, AI915291, AW152182, AI368579, AI499963, AI923989, AI638644, AI254731, AI866469, AI561356, AI536685, AW166870, AI884318, AI452560, AI802240, AI266643, AI475371, AI554516, AI539847, AI673363, AI345688, AL045349, AI682968, AI669864, AI625464, AI359787, AW162194, AI422688, AW050850, AI245008, AI819202, AI912434, AL046944, AI887389, AI648458, AW029566, AI096481, AI638798, AI537837, AI797538, AI919500, AI610402, AI818353, AI570807, AI499581, AI758309, AI499570, AI366900, AW118518, AI301046, AI619662, AI679266, AW022584, AI446511, AL046595, AI891102, AI250627, AW168875, AI433611, AL036638, AI932794, AL138399, AI687168, AI917963, W74529, AW029611, AI471429, AA806719, AI678688, AI963625, AI097137,

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HE2BW32	41	609468	1 - 272	15 - 286	AA262522, F06472, AA295016, AA366764, AA523700, AA296800, AW246977, AA482405, AL037121, AA127877, AI929496, AW328197, R92273, AA447905, AA033682, H71644, AI346910, N34110, AA428825, AA166921, AW250621, AI702323, AA418151, N34715, AI814423, AI347153, W40205, N49047, AA406476, AA406516, AC006238, AF057358, AF086627, AF044670, AC005318, AF115503, AF157497, and AF086630.
HAAU21	42	670606	1 - 354	15 - 368	AA513506, AB015317, Y12226, X54424, AJ224114, and AJ224113.
HE8DL23	43	693641	1 - 487	15 - 501	W78996, AW172850, AW169307, AW401638, AA399131, AA251893, AI361767, AB015318, AF068706, AF068707, AL135999, and AL135999.
HFTCM92	44	928851	1 - 769	15 - 783	AI589776, AI057117, AW272585, AI246523, AA767227, AI625485, AA873003, AI239712, AI955774, AW296331, AI479753, AI741538, F32315, AI674694, AI932376, AA804789, AA044610, AA993510, AA243346, F36914, N55553, AA262732, AI961836, AI684523, AI127216, AI927868, AA720891, AA324979, AA953487, R86959, AA039578, AA487796, AI886998, AA485892, AI685404, R05274, AA912800, F18062, C00227, AA747721, R05331, and AA326305.
HE6BQ76	45	775616	1 - 353	15 - 367	AA099543, AA669197, AA127290, R18710, H08922, W79474, AW118919, AW304022, N41498, AA213595, W86555, H51174, Z25317, AA304745, AI609937, H57648, AF083033, AR028451, AF072860, Z84477, and AF083032.
HAMFP60	46	715097	1 - 493	15 - 507	AW451560.
HHFHY84	47	715098	1 - 375	15 - 389	AW451560.

HE6FD03	48	1150900	1 - 932	15 - 946	AA431537, AW404444, AI283081, AI355127, AA431213, AI025060, AI241247, AI017479, AI276732, AA700252, AA737782, AI351906, AI564874, AA861742, AI051964, Z40548, AI864024, AA976182, AI363484, AI350761, AA688143, AI160881, AI028241, AA662752, R84964, AI332354, F08983, AI471267, R78868, AA670442, AI920956, AA312704, AA229532, AW411050, AA420758, AA830333, AC006547, AC000083, AC000097, AC003060, AC005664, AJ236691, S68736, A93016, A91160, and AL133565.
HDTFT90	49	1165338	1 - 685	15 - 699	AI623819, AI799883, AI814412, AI952039, AI972947, AI826075, AL045697, AW337996, AA167742, AW167132, AW264027, AA209462, AI394192, AI458169, AI289432, AI863491, AI620722, AW440580, AI984766, AI758979, AI610824, AI287482, AI289435, AW002172, AA648408, AI634183, AI125609, AA150039, T65400, AW207026, W93405, AI949306, AA150203, AI659678, AA741391, AI951377, H09775, AW166423, H24845, AI453490, R01203, AI631154, AA258738, R62398, T54772, AI434048, AA744971, AI857358, C00469, AA258877, AI949348, AI469756, F09546, AA449685, AI299480, R62397, AI672560, AW089174, AI690289, AA514475, AI078116, AA456139, AI912915, AA093121, AA954932, AW025809, AW305231, AI224855, AI093059, AI341411, AI479298, AA718988, AI734889, AI827201, N95744, AI830516, AW303777, AA846245, AW014387, AI869379, N25902, AI042513, W94876, AA081121, AA152265, N63437, F21778, AW298184, AA150155, AI241692, AA988159, AA594584, W20340, AA709203, AI699865, AI677796, AI433157, AI702073, AW163834, AA225339, AW026882, AL079963, AL038605, AL119863, AI619502, AI312428, AI918449, AI587121, AI340603, AI802542, AI923989, AI627988, AW198090, AL036274, AI569583, AL120695, AI568132, AW022808, AI538259, AI801325, AW268067, AI349645, AI569945, AW268253, AI926790, AI815232, AI620284, AL048656, AA470491, AW161156, AA640779, AL045500, AI348854, AW129106, AW302992, AI537677, AI348897, AI868204, AW161579, R36271, AI284517, AI670009, AA572758, AI952217, AI815855, AL041772, AL036403, AI564719, AW089572, AL036631, AI538885, AW151136, AI349226, AI439452, AI874166, AW169604, AL110306, AI473536, AI627360, AL048323, AI783504, AI929108, AL048340, AW163823, AL120853, AI433384, AI249497, AW022682, AI890833, AW193134, AL036980, AL045774, AI446538, AI589267, AI886753, AI309401, AI500523, AW074993,

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HPJCU63	50	1082458	1 - 884	15 - 898	AW016133, AI935230, C04161, AA680307, AA947457, AI765980, AA889263, and AI146454.
HFITE38	51	793203	1 - 412	15 - 426	AW401574, AW411042, AW391980, AA852415, W61124, AL138163, AI313133, AI554624, AA331917, W76458, AI909669, AA357067, D55453, AW361222, T08329, AA035103, AA371686, AA378552, AA116099, N45490, AA452303, R15571, AA310762, AA613412, AW360837, AA478499, R08104, T84898, AA551115, AA894909, AA328222, AA654947, AW088409, AI951963, W23225, AI205283, AA657656, C18294, T32049, AA225936, AF126181, U92544, AF128528, AF128527, and Z98046.
HDPDH64	52	796509	1 - 506	15 - 520	AI929457, AW249044, AI739490, AB020706, X14972, X53773, X14971, and Z66177.
HFKKS58	53	1158800	1 - 1441	15 - 1455	AW246359, AW246572, AA827562, AA514488, AL135673, AI539185, AA459956, AI190270, AA778031, AA083889, AI539830, AL134250, AA255533, AA460045, AA083888, AA532881, F19104, AA384265, AA749416, AI972095, AA247961, AA702934, N66268, AA364111, N79931, AI630888, AA255505, AW438881, AA729375, AA334602, AW363733, T06791, AF116910, and AW662264.
HE8CM38	54	1197903	1 - 1543	15 - 1557	AW341277, AA449052, AA677433, AI375482, AI393099, AA649052, AI913346, AI859698, AI417958, AI373524, AI769760, AA442905, AW271751, AI685790, AI684073, AW243463, AA470724, AI670074, AI344642, N76222, AA701021, AA758141, AW029224, AI040528, AI376742, AA693735, AW296327,

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HJBU67	55	856922	1 - 717	15 - 731	AA314478, AA380939, AW239035, AA380937, AF132951, AC008910, AC008910, AC026230, AC026230, and AC026230.
HHEHD10	56	1204696	1 - 1589	15 - 1603	AI952147, AA827782, AI523970, AW008938, AA236865, AI673370, AW043829, AI143323, N36986, AA306716, AI361743, AA460666, AW080829, AI914077, AI214786, AA862831, AI963652, AI805253, AI423188, AI003936, AA994686, AA130868, AI913070, AA533231, AI358965, AI873692, AA569719, AA865951, AI272308, AI445569, AA644481, AA179075, AA968581, AI418685, AI669710, AA130923, C00906, R85067, AA502585, AI088486, N46300, AA176755, AA847433, AL048511, AL122098, AA436168, AA436295, AI445942, and AI224003.
HHEND45	57	919630	1 - 338	15 - 352	
HE8EQ22	58	1031960	1 - 801	15 - 815	AA306763, AA471282, R60471, AA355988, R97538, AI984936, AA164607, AA284002, T55524, R54342, AF156778, and AF155354.
HSACD83	59	911588	1 - 543	15 - 557	AA910780, AA374903, U44096, and AB028997.
HHGBO53	60	1091714	1 - 899	15 - 913	AA130923, AA847433, AL048511, and AL122098.
HE8FD82	61	1154785	1 - 1328	15 - 1342	AI768630, AA706436, AW157621, AI078119, AA524776, H30754, AW150289, AA532707, AW139797, AW021449, AI621272, AI016209, AI860138, AW135889, AA657976, R13815, AI918682, AI968824, AI206287, AA374031, H81740, R88478, AA077298, AA779405, AA135075, AA364727, AA015913, AA371202, AI394720, T07862, AA825944, AF147198, C14420, AI971484, AI340575, and AI052382.
HOHAS44	62	914810	1 - 809	15 - 823	AL035953, AI124738, AW401606, AA523304, AW402591, AW401458, AW367481, W39252, AW401461, AW361591, T08548, AW361667, AW361610, AA136313, AW361658, AW361482, F11247, AW361674, W61067, AA374706, H08891, F08026, AA361745, AA351469, N88445, H14875, AW392259, N88487, Z28364, F12897, R14296, AL138414, AA828798, AA319125, W63585, R29411, T07869, W52703, N89245, AI752182, AI133443, AA460616, AA205396, AW378459, AA774792, N30042, N86188, AA095400, N40686, N85070, AA351168, AA465136, AA037173, AW379721, T74738, D21260, U31757, J03583, and AA829032.
HE8OF42	63	1117857	1 - 533	15 - 547	Z19388, and AA329822.
HSKHS71	64	1154798	1 - 712	15 - 726	H71659, AW300749, AI829537, AI005241, AC005208, AC005736, AC007993, AC007151, AC004216, AC005088, AC004491, AC005105, AC005482, AC005104, AP000252, AC005011,

					AP000212, AP000134, AC004167, AP000031, AF024533, AC004656, and AP000564.
HISBT75	65	1181020	1 - 850	15 - 864	AI589776, AI057117, AW272585, AI246523, AA767227, AI625485, AA873003, AI239712, AI955774, AW296331, AI479753, AI741538, F32315, AI674694, AI932376, AA804789, AA044610, AA993510, AA243346, F36914, N55553, AI961836, AA262732, AI927868, AI127216, AA720891, AA953487, AA324979, R86959, AI684523, AA039578, AA487796, AI886998, AA485892, AI685404, R05274, AA912800, F18062, C00227, AA747721, R05331, and AW512952.
HFVKF77	66	930964	1 - 3774	15 - 3788	AI150873, AI189373, AL042988, AA632159, AI346260, AI523411, AI024354, AA808543, AA854033, AW088247, AI758696, AW073231, AI815545, AI418920, AI825902, AL035953, AL037320, AA579628, AW151081, AA587235, AW189155, AA576880, W63585, AI954477, AW338975, AI828607, AW085567, AW130637, AI623663, AI983431, AI620641, AA133366, AI583234, AA576375, AI445524, AA774792, AA771885, AA507864, AI124738, AW401606, AA723567, AA523304, AW188638, AI752181, AI469475, AA743810, AI625556, AI520737, AI692845, AI291738, AW401458, AA460616, AW402591, AW440557, AW264616, AW378459, AI797318, AA877897, AI453366, W52703, AA062675, AI348108, AA431305, AA744898, AI096834, AI568940, AA598662, N42214, AI829306, AI689212, AA588710, AI364980, W92760, AA707687, AA737920, AI362019, AW367481, AA662924, AA648800, AI146983, AI360896, AI335953, AI335738, AA693465, AW243835, AI355350, AA513467, AA653209, AI799692, AI537502, AA024674, AA844498, AW401461, AI174402, AI087241, AI124681, N35697, AA974150, AA971015, AI249769, AI816487, AI289906, AI087251, AA069996, AI348606, AI268906, AW339188, W39252, AA720740, AA653122, AI077988, AA126442, W56132, W59975, AI299885, AA954634, AI143573, W07025, AI095842, AI251001, AI342779, AA620496, AW373167, AA962293, N33870, AW022463, T23553, AI752182, AI061217, AA610153, AI635496, AI088481, AI049998, AA351429, AA729067, AI954294, AW382249, AA775247, D57958, AA461543, AA025033, AW361591, AI039984, AA775965, AI869140, AA962136, AA890566, AI335637, T08548, W15283, AW361667, AI275152, AA074800, AI362481, AW361610, AA351469, AL042411, W01330, AI537138, AA086189, AA487036, N63087, T08547, AA024458, H82140, AA136313, AA100413, W77960, AW361482, AW068048,

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HJABW64	67	931402	1 - 451	15 - 465	AA310521, AA314039, AA232595, AA223451, AA081255, C16722, and AA188117.
HCEMY90	68	932927	1 - 592	15 - 606	AA324130, AA361570, R12848, AF214633, AF214633, AC024242, and AC024242.
HHFLF63	69	933854	1 - 772	15 - 786	AA280252, AI693282, AA170809, and AC023295.
HSKAN19	70	935229	1 - 1579	15 - 1593	AW007702, AI564551, AI924539, AW007297, AW262796, AW419073, AW004917, AI650277, AA122325, AI653276, AA127688, AI114823, AI800389, AI798176, AA127787, AI283151, AA151029, AW024375, AI654070, AA806020, AI082416, AA131394, AI147624, AW001184, AA532361, AI690703, AA316383, AA628956, H49147, AA218613, N44016, AA218738, AA179610, AW169382, T25520, AI888971, AI911536, AA622966, AA227688, AW275250, AA150922, AA131553, AI698898, N34949, C14182, AI363988, AI337382, AI444966, and N50769.
HE9SE88	71	1152240	1 - 1278	15 - 1292	AA306657, AA363705, AI651100, AI824886, AI651101, AI978581, and AC004527.
HDTDG41	72	942490	1 - 1660	15 - 1674	AW450923, AL135736, AW192703, AI655462, AW337165, AI741321, AW193820, AW338706, AL135737,

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HTEPX32	73	870698	1 - 1349	15 - 1363	AI217947, AW237109, AI918745, AI968403, AA934788, and X84693.
HEGAB84	74	1128320	1 - 463	15 - 477	AI222155, AA305409, AC007040, and Y12724.
HTEKQ12	75	1213746	1 - 2628	15 - 2642	AI655698, AI913638, AI917717, AI640777, AI650912, AA579656, AW294581, AI125546, AI244551, R16227, AA127442, AI220551, AA781390, AL045671, AA913470, AI024395, AA316404, AI652678, AA127441, AA585439, AA585440, AL044201, AL037341, AA889244, R40605, AW083791, AL040768, AL044015, AL046147, AL042245, AL049007, AL043950, AL043468, AL042700, AL038532, AL036500, AW299612, AL046994, AL042712, AL040414, AL040571, AL046097, AL044771, AL134123, AL037435, R40606, AL044258, AA585434, AL041577, AL046150, AL037371, Z28355, AL037335, AI535639, AA994975, AL040856, AL043848, AI014240, AL043570, AL046914, AI525556, AI541510, AL046850, AA585453, AL037323, AL041459, AI546855, AI525316, AL044029, AL043814, AL048647, AL043128, AL044064, AL039316, AL043201, AL043923, AL079876, AI525328, AL039338, AI541374, AL043935, AL040252, AL045994, AL037727, AL045991, AL043537, AI541514, C15189, AI541523, AL037343, AL047593, AI556967, Z30131, AL044377, AI526180, AI546999, AL043936, AL043845, AI525306, AI541534, AL044199, AL043903, AI557807, AA585101, AL041374, AL040329, AI541317, AL037443, AL040082, AW002446, AI541509, AI526140, AL043604, AI541017, AI525431, AI546828, AL040263, AA585356, AI526194, AI541365, AL042096, C16300, Z40910, AI547039, AI526196, AL040148, AL043627, AI541535, AL041523, AL044583, AL038983, AL041730, AI546945, AL046392, AI540967, AL044272, AI557799, AI557731, AI541508, AL042135, AL040090, AI541307, T11028, AI526144, AL040052, AL044274, AI546899, AI535660, D61254,

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HNTSX71	76	1221117	1 - 1803	15 - 1817	H25971, H45756, AI417586, AA230146, W44525, H25938, AW084173, T40629, AL133035, and Z84465.
HFCFH75	77	951202	1 - 789	15 - 803	AA209338, AA209404, AA299216, and AA314039.
HEOQY55	78	1204693	1 - 2138	15 - 2152	AI740584, AW002002, AI985800, AI762576, AI798477, AA534961, H15320, AW081499, AI889034, AI278720, R52194, R16209, R82785, AA314880, AI918168, AI824664, AI926177, R16208, F04683, N76763, T84274, W92215, R17096, T87269, AA302483, T78575, W92216, T79785, H41133, R17095, T79354, T78491, T87183, R11236, AA377828, Z41900, R11184, T91358, AI822090, T91445, T85160, F01406, AW150480, T50809, AW090340, U90728, AW002004, R53223, H41178, AB008793, AB012254, and AF147342.
HPJDQ48	79	952185	1 - 1437	15 - 1451	AA828379, AA837189, AA721432, AI826972, and AW451560.
HTTCB17	80	1174865	1 - 2957	15 - 2971	AI499419, AI820049, AW070938, AL042008, AA984061, AA781142, AL042032, AL041636, AL043672, AA521150, AI090248, AA533251, AW183150, AW090185, AA236580, AI986141, AA234444, T64870, AI039274, AA761405, AA688276, AA285153, H58691, AI025833, AI283608, AA454934, AI223971, AA421748, AI025468, R58865, AA740862, AA836810, AA911678, T40471, AA157675, H23351, AF012373, N53133, AI698072, T67438, AI912060,

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HE2SY09	81	953828	1 - 633	15 - 647	AW249044, AI929457, AL042867, X14971, AB020706, and AC006942.
HFEBN52	82	810429	1 - 438	15 - 452	AW025309, AW304444, AW084572, AI436722, AI373537, AA335976, AW024833, AW269191, AA700625, E15324, E15326, AL136001, AL136001, AL359399, and AL359399.
HCHMO62	83	955551	1 - 465	15 - 479	
HHSDM19	84	956045	1 - 1835	15 - 1849	AA461035, AI672417, AI922318, AA455380, AA207253, AW073828, AI656613, AI015897, AA081097, AI354270, AA223211, AA187149, AA207246, W07268, N79769, AA453976, AA765863, AF114029, AA456020, AA382282, AI287653, AA648749, R41461, AI535793, AI536006, D61645, AA992075, R58462, AA564978, AA204953, AA232403, AA382281, AA209404, Z64530, and Z64529.
HDTIT49	85	956917	1 - 841	15 - 855	AL138392, AA427786, T70793, AL138393, and AB033051.
HTLGW19	86	1163072	1 - 1948	15 - 1962	AA523383, AI742620, AI761443, AI952075, AW058000, AW051868, AI003892, AI963321, AI125092, AA740995, AA505650, AA458975, AA459191, AW292537, R36885,

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HJPCA88	87	958942	1 - 686	15 - 700	AW245543, and AW245988.
HE9TA54	88	960253	1 - 1847	15 - 1861	AI978973, AW369076, AW370703, AA534881, AW378876, AW369110, AI804249, AW327458, AW135792, AW369167, AA453172, AA310335, AI090260, AI754244, AI479778, AI191452, AI754645, W49847, AI147878, AA315343, AA449642, AA204775, AI460118, AW020839, AI904759, AA643726, AI922592, AA452494, AI274979, AI087146, AI635048, AI635041, AA113120, AA629855, AA644499, AI784511, AA306559, AI312811, AI445708, AA779358, AA449479, AI190399, AW369088, AA229791, AI246414, Z78389, AI433738, N94029, AI272914, AI378550, D60918, AA713577, AA501589, AW025696, AI590682, AA669450, AA584300, AI289061, N68360, AA748622, AW194963, AI630019, AA831867, AA502188, R68043, H18960, R52950, AI350618, AA429958, AA379878, T80097, R23764, AA333242, AI401408, AA356163, C04569, C04581, AA306800, R53735, AW027179, R37182, AA262222, AA112441, AA331867, AW105576, C16683, N87167, H62030, AA937229, AA206893, AA463653, T07391, AA092767, AI129491, AI591277, AI590460, D19876, AW023484, AI343133, AI345777, AI349943, AI318121, AF083246, and AF031483.
HCFC40	89	963756	1 - 4563	15 - 4577	AI003504, AI978786, AI942472, AW157102, AI923428, AW305224, AI337325, AL043698, AI949346, AA779822, AA902404, AA247183, AW450949, AI183371, AI422983, AI085398, AI624398, AA653306, AI129991, AA702436, AW408332, AW166329, W73118, AL118913, AA308483, AI088358, AI095015, AI146768, AI718426, AI002387, AA310294, AI268360, N51414, AI754081, AW177065, AW238419, AA779348, AI950139, W86275, AI263017, AI094353, W31856, AI439425, AI057081, AI248226, AA699336, AI370781, AI805789, AA284436, AA234679, AA490361, AA889342, AL043697, W77820, W73138, H82394, AW263912, N80171, N34343, W78224, R99060, AA962061, AA807778, AW368126, W39284, AA678399, AW368120, W86309, N42811, C04873, AA225086, AW368023, AA679450, AI473702, AA628546, AI909121, T34767, H30308, H08335, AW175578, AW182966, AA768970, T23851, T08453, T16462, AI743061, AA234752, AA225217, R62711, T35501, R59446, W72185, AA358369,

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HHBEN77	90	1189720	1 - 1188	15 - 1202	AW044467, F36391, F24585, F32675, AA180314, F25326, F28193, F28533, F28615, F19619, F24152, AW237359, F29659, F22107, F29073, AI684954, AI936300, F18281, AI202754, AA346025, F25534, F32185, AA345800, F24544, F29939, F35657, F37193, AA179959, F34439, F30682, F34910, AA311094, AW292728, F35448, F26754, and AJ011118.
HHESP66	91	1154641	1 - 1036	15 - 1050	AI125852, AA259012, AA224099, AW087456, AA326934, AA326933, AC005188, AC006291, and AF028722.
HAHHQ37	92	967442	1 - 2226	15 - 2240	AW401851, W07754, AA806378, AA947309, AI921808, AI654857, AA310232, AW176705, AI651405, AI660075, H14527, AI431898, H26800, N35426, R46681, AI631881, C17310, AI672616, C16874, AI624730, AW182813, AI460327, AI624728, AA620869, AI025529, AA720646, F35365, AA650038, T40637, AI201217, AF053356, and AR016407.
HAMAA10	93	968749	1 - 958	15 - 972	AI971343, AW380724, AA195950, AA192963, AI620346, AW449825, F21243, Z24852, T30560, AW380723, Z17422, AA176595, AA176955, F00172, AA195854, AA192662, AA194350, and U76618.
HHFMH12	94	969324	1 - 3882	15 - 3896	AI096627, AI750041, AI589918, AI870013, AI431911, AW071873, AI567485, AI492558, AW082735, AI493768, AI971206, AW068564, AI494149, AA158252, AI422826, AI363488, AI460100, AW104306, AA100840, AI755276, AA476207, AI992015, AW026405, AI190217, AA678831, AI376927, AI738539, AI439206, AA037160, AI418906, AI361483, AI038534, AA877117, AI356122, AA425180,

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HDTIE58	95	971339	1 - 2502	15 - 2516	AF150174, AI417513, AI698235, AL119457, AL119399, AL119324, AL042544, R56970, AA471187, AL134524, Z99396, AL121306, AL119443, AW392670, AL119464, AL134920, AW372827, AA572761, AR035224, AR019098, I25027, AR054109, I44515, I26928, I26930, I26927, I25041, I44516, I85513, AR009152, AR009151, AR027099, AR020199, AR001287, AR064321, AR020200, A94046, A94054, AR020198, I05393, A10617, AR028792, AR020197, A01324, A01323, AR019094, AR034783, I63120, A92666, I89986, AR067733, A92668, I49890, A92667, AR064322, AR064323, AR064320, A94048, A94061, A92665, A32110, AR038321, AR038307, AR029418, AR067734, AR067731, A49045, AR067732, AR029417, A83642, A83643, A70359, I05430, AR028791, AR028793, AB026436, A91752, AR060234, AR066494, A46343, A46342, AR032878, A92081, A92080, A92077, A92078, A92079, A91751, A81671, AR054110, and AL049423.
HIBCN93	96	973679	1 - 1492	15 - 1506	AI056401, AW072652, AI885072, AW205916, AI879122, AI885524, N34233, AI953626, AI768363, AI500165, AI887770, AI651798, AA393235, N35730, AW297174, AI802927, AW271854, R56346, AA249118, AI377463, AW070857, AI824909, N53527, AA948310, AI206861, AA572777, AA570002, AA814424, N25635, AA255602, AI478500, N25539, AA634056, H07018, N28490, AA416965, N34136, N34013, AA902860, AA255576, AW029208, AI690664, AI198003, H99526, H05467, N49189, AI190195, AI864484, N30121, H99763, AI024777, AA379362, AA262183,

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HSWAP86	97	1165386	1 - 783	15 - 797	AI057117, AW272585, AI589776, AI246523, AA767227, AI625485, AA873003, AI239712, AI955774, AW296331, AI741538, AI479753, F32315, AI674694, AI932376, AA804789, AA044610, AA993510, AA243346, F36914, N55553, AA262732, AI961836, AI927868, AI127216, AA324979, AA953487, AA720891, R86959, AA039578, AA487796, AI886998, AA485892, AI685404, R05274, AI684523, AA912800, F18062, C00227, AA747721, R05331, AL134110, AL134524, AL045327, AL038878, AL045328, AL047163, AL042898, AI318479, AL037295, AL038838, AL037343, AL048677, AL038651, AI547295, AL038983, AI142134, D29033, AL037436, AL037335, AL037323, U46344, AL037727, AL037443, AL038532, AL038822, AL038761, AL037435, AL135012, AL040472, AL043941, AL039432, AL044125, AL043923, AL043814, AL047012, AL041238, AL044186, AL040617, AL043845, AL041347, AL038024, AL045494, AL040576, AL040193, AL045753, AL042523, AL041955, AL040463, AL047170, AL048657, AL044037, AL041635, AL040294, AL044064, AL041459, AL041577, AL044162, AL040464, AL047219, AL040625, AL045684, AL041752, AL046850, AL040768, AL045671, AL046994, AL046914, AL048714, AL039360, AL038745, AL040052, AL043496, AL040444, AL043538, AL040621, AL040510, AL043467, AL043677, AL040839, AL043492, AL041602, AL044074, AL041730, AL041523, AL043627, AL041374, AL043848, AL043570, AL047183, AL042135, AL046442, AL041324, AL042420, AL041133, AL039643, AL039316, AW363350, AL041098, AL040322, AL046392, AL045891, AL040119, AL044272, AL044258, AL037341, AL038040, AL041096, AL042096, AL042655, AL042519, AL045817, AL042468, AL041168, AL049018, AL079852, AL041163, AL041159, AL045920, AL040148, AL047057, AL042741, AL038041, AL040458,

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HHSGL32	98	1216549	1 - 2622	15 - 2636	AW341277, AA449052, AA677433, AI375482, AI393099, AI913346, AA649052, AI859698, AI417958, AI373524, AI769760, AA442905, AW271751, AI685790, AL045906, AW243463, AI684073, AI670074, AA470724, AI344642, N76222, AA701021, AA758141, AW029224, AI040528, AI376742, AA693735, H42313, AW296327, H12220, AA464605, AA835707, N54520, T26462, AA121186, AA758284, AA430532, AI470967, AA121187, AI565321, N50674, AW193102, AA885708, H30000, T26463, AW079408, AA864717, T17007, AA761856, Z40783, AA887660, AA373205, C05171, AA918565, F07717, H43079, T99533, R20437, H30001, AA371324, AW020286, N50763, AA665044, H46108, T99427, R43557, AI368375, AI915506, AI913702, R95437, AA374682, D79994, AL035461, and L10617.
HAIJBH69	99	812164	1 - 311	15 - 325	AL038926, AL038950, AW408001, AW391591, H55315, AF190862, AL035496, AL110219, D63876, and AL035496.
HAGFN07	100	953606	1 - 1224	15 - 1238	AW249532, AI813508, AI823915, AI342400, N37069, AA568252, AA947519, AI150772, AI677789, AI037990, AI688701, AI016445, AI143732, AA533883, AI565693, AA639295, AI083663, AA621146, N27680, AA831223, AA132974, AA057865, AW245927, N20843, AA918001, AI368438, AA121653, AA057158, AI078660, F36772, AA064652, AA602087, AW083290, AI685603, F28422, W46636, AI673324, AA564277, N75480, AA056990, AA602067, AA195380, AA056931, F32570, AA862954, F20800, AI688690, AA502303, T82852, AA373896, AA741294, AW083609, AA635261, AI056552, AA627771, AI032312, AI953435, AI480060, N30051, AI423931, AI265981, AW360851, AA421701, AA708457, AA670135, AA532823, T77227, AW058031, H73306, AA584493, AA584183, AI003123, AF161387, AC005480, AC005914, AF165926, AF111168, L44140, AC005566, AC004686, AC004685, AC005821, U91326, AC004448, AC005736, AC005778, AC002045, U91321, AF196969, AL022326, AC002544, AL031281, AC005585, Z84466, AC004876, AL133246, AL049569, AC004526, AC003042, AC002072, AC005391, AC006312, AL049776, U95742, AC005082, AC007226, AC010205, AC002369, AF111169, AC005409, Z93017, AC002350, AL024498, AC002126, Z83844,

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HFRBZ64	101	575037	1 - 651	15 - 665	
HMAER78	102	702735	1 - 258	15 - 272	AC074333.
HKAAV49	103	1179713	1 - 2324	15 - 2338	AI799049, AI817763, AI858292, AI760537, AI765842, AI420944, AA251693, AA486025, AI473693, AA312702, AA886700, AA994059, AW131318, AI829801, AA504162, AW381909, AA694610, AA282359, AI906052, AW293269, AI818103, R41095, AI857294, AA488643, AI744493, AA826123, AI684375, AA749198, AI422295, AI809857, AI494356, AW241550, AW340230, AA345053, AA961472, AA865761, AW291047, AW169873, AA836393, AW379702, AW149767, AW293108, AI493451, AA251293, AW444604, AI684607, AI798963, AA811232, AA282239, AA806298, AI826070, AA927651, AW296764, AA027336, AW451802, AW084424, AW363396, AI358492, AW296453, AI741498, AA765031, N79797, AA588465, AI952176, AI248480, AA635240, AA527689, AI023395, AI394251, AA563855, AI201310, AI299742, T62220, AA989547, AI453478, AI361852, AW328273, AI361088, AA534434, AI698315, AI089866, AI201017, AW022967, AA586932, AW043580, AI150585, AI816772, AI040272, AI379533, AA554854, AW411504, AW268671, AI702328, C21347, AA765074, AI393879, AI037874, AI919086, R16122, D25647, AI184722, AI095412, AI370571, AI458842, AA569975, D57706, AI479367, AW189870, AI310479, AA226696, D57993, AI707799, AI223264, AW338591, AI587380, AI582086, AI301338, AW273757, AI952041, AI796665, AA687975, F36849, AI240389, W84553, R32337, AI601274, AA360214, AA326781, AI685411, AI983171, AA009712, AI858644, AI423714, AI264456, AI707658, AA455918, AI274115, AI718515, AI720566, AA995995, AI752880, AA187492, AI709267, AA083781, AA009518, AA009605, AA857434, AA187493, AA733076, AI803597, AI263960, AI376377, W96223, AA041372, AI350163, AI144406, AI308932, AI288655, AA679555, AI127377, AI346738, AI000041, W93998, AA256978, AI276726, AW302468, AI633656, AA558214, AI887048, AA973779, AA583257, AA443217, AI336629, AA922486, AI263444, AA501596, AI679621, AA723834, AI633571, AI749034, AA534316, AA729899, AA679404, AI354810, N92309, AI417142, AA625398, AI224534, AA583151, AA444051, AA922429, N91164, F24871, AI206667, AA838247, AA011173, F15777, AA640113, AI349555, AA995062, AA722750,

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HAPQS74	104	855538	1 - 761	15 - 775	AI401739, AI743497, AI198899, AI807434, AA040087, AI288962, AA158618, AA918798, AA969724, AW293072, AI493380, AA412433, AA781779, AI207883, AA122226, AA978278, AI970236, AW087431, AA040134, AA282679, AA412432, N27578, and AF136450.
HTEPM33	105	870561	1 - 816	15 - 830	AA824347, AA889787, AI425084, AA868962, AI190895, AL132776, AF083394, AL132776, AL132776, and AL132776.
HLTES49	106	872262	1 - 381	15 - 395	R21493, AW247091, AA318712, W69555, AA373044, W03593, W81335, AA156841, AA150985, AA151036, AA025956, AA526626, AA341135, W81261, W38490, AA344784, N42066, W05636, AW404642, AA458523, AA355413, H22398, AW051303, AI160442, N36565, T20101, AI949608, AI808171, AI126861, AI147464, AI188724, AI417410, AI675163, AI149310, W88848, AI193857, AI333419, AA987272, AA889985, AI159779, AI203946, AA772316, AI190133, AI088553, AI148793, AI147633, AA723186, and AC004707.
HDTEJ81	107	919873	1 - 790	15 - 804	AW051303, AI160442, AI675163, AI417410, AA779534, AI949608, AI147464, AI188724, AI808171, AI193857, AI149310, W05636, AI126861, N36565, AA987272, W81261, AA772316, AA156841, AI333419, AI203946, AI159779, AA458523, AI190133, AI088553, AI147633, AI148793, AA151036, N67749, AA723186, AA025956, AA150985, AA889980, AW136090, AI128528, AA150928, AA813501, AA150938, W81335, AI091251, AI494503, AW273369, AA525973, AW404642, AI015920, AI347389, W69555, AW247091, AA526626, N80199, AA716232, W03593, AA806495, AW265401, AI160615, AA536057, AA025768, AI023538, AI022607, AA730333, AI004543, AA373044, AA962262, AA516362, AA503958, AA774485, AI635460, AI022762, W69266, AA641289, AA341135, W88848, W81336, N32922, AA318712, T30218, AA992404, AI675588, AI636840, W38490, AI283855, AI262717, AA344784, F35937, R42876,

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HTLCY21	108	910212	1 - 851	15 - 865	R88948, H51012, H30614, R85182, C15076, D80164, D59467, C14389, D59502, D59275, D81026, D80195, D59619, D81030, D80210, D80240, D50979, D80227, D58283, D80022, D80166, D51799, D59859, D80219, D80193, D59787, D80391, D51423, D80253, D80043, D80269, D59610, D80212, D80038, D80196, D80188, D59927, C14331, D57483, AA305409, D80366, D59889, D50995, D80045, D80241, D80251, D80378, AW177440, D80024, C14429, D51022, AA305578, D51060, T03269, C14014, D80522, AW178893, AW378532, C75259, AA514188, D52291, AW179328, D80248, D51250, AW369651, D80134, AA514186, D58253, AW178762, AW178775, AW177501, AW177511, D80133, AW176467, AW360811, AW352158, D80268, C05695, T11417, C14077, F13647, AW352117, AW375405, AW377671, AI910186, C14407, D80132, AW378540, AW366296, D80302, AW360844,

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HKAKF45	109	1090988	1 - 826	15 - 840	AW381241, AL117504, AB023174, and AL096678.
HMWDF88	110	906769	1 - 349	15 - 363	H94922, R78249, AA448990, R14119, and N47060.
HHECU86	111	945062	1 - 692	15 - 706	AW068821, AA179850, AA347950, and

HTPHO01	112	1152424	1 - 1176	15 - 1190	AF132937. AA045042, AA843152, AA156920, N93318, AI336321, AA156748, AA919107, W72463, AA830277, AA037135, AI080539, AA156724, AW054682, AA412716, AI214531, AA156830, AI268319, AI192613, AI089320, AI129828, AA744675, AW054721, AI368693, N30238, AI056447, W37283, AI582210, AA401901, AA832431, AA722658, AI338219, AA505698, W67440, AI972030, AI139094, AA926692, W32525, AI375239, AI742513, AI344126, AW026339, AI338181, AI970997, AI074233, AI139159, AA452125, AI300753, AA731154, N95054, AA928924, AI830575, AI494078, AA644138, AI751817, AI183773, AI675706, AI148098, AA995310, W60021, AA954291, W44927, AI199971, AA130261, R48544, AI991339, AA911327, AI359933, W67441, AI285066, AA884026, AI095687, AI203669, AI559949, AA805553, AI192137, H01993, W44501, W76019, R64418, AA482591, AW170013, AA035330, AW150567, AI291185, AI264416, AA194283, AI300238, H28315, AI864148, W25141, AW340658, R68955, AA938400, AA135790, W37796, AA772619, AI494112, N57130, AI955746, AI363456, AA280408, H43891, R27968, AI307177, R68838, AI376902, AI888544, AI936538, AI198333, C17813, R32608, AI337473, AA894852, W24433, AA194406, N76141, H43929, H28314, AI300609, AA094826, AI655355, AA363376, N93111, AA149447, AI186703, W23603, R63811, AA642334, R48631, N94620, AA960954, AA988685, AI352072, AA866053, AA135746, W05645, W32641, AA156689, H39712, AA452348, H13826, AA918331, AA612832, AI193848, AA554306, AI093632, AI276589, AA447655, AI273430, N30561, H28693, AA134664, AI373118, H04586, AI278504, AA095991, AI587139, AW341382, AI818830, AA994085, F23391, AA039759, H13182, AI934888, W24049, R32498, AI078102, and AF169284.
HFXKR90	113	948399	1 - 575	15 - 589	AA453713, AW058431, AI796911, AI800218, AI346281, and AL117551.
HDPBQ32	114	949191	1 - 2906	15 - 2920	AL041780, AA447233, W63594, AI479623, AL120043, AI862014, AW370548, AW370546, AA833890, AA528106, AW342135, AA767439, AI884921, AA810497, AI479859, AW246967, AI598172, AA316311, AI862137, AA808946, AW438512, AW250167, AW014235, N48194, N31847, AA565004, AI147687, AI421531, W94723, AA709397, AI041972, AI860296, AW029341, AI311132, AI097206, AI124091, AI363367, AI093332, AW273088, AI017231, AA658369, AA669438, AA488942, W94478, AA436731, AI439831, AI986078, W26165,

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HNTAR73	115	949289	1 - 363	15 - 377	AA453713, AW058431, AI346281, AI796911, AI920904, AI276048, AW196781, AI264211, AI022218, AI201482, AI583539, AI955668, AI911743, AA526367, AI924093, AI766300, AI983710, AW026429, AI800218, AI623560, AA922838, AI565141, AW299693, AI306731, and AL117551.
HHEGC16	116	950778	1 - 1483	15 - 1497	AI074147, AI249752, AI991117, AA573289, AI744674, AW372737, AW383987, AI951269, AW372734, AW372745, AI097133, AW081142, AA121349, AI560208, AI160271, AW388634, H69344, AI309528, AI310351, AW073286, AI222028, AW372735, AA121301, AW170797, N31288, AW372730, AA278853, H47623, AA742972, AW363751, AW372731, AA864447, AW372736, AA173309, H47925, AW372742, AA278420, AI476011, AI572193, AW372739, AW372744, AW188877, H38254, H69345,

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HSIGE72	117	952275	1 - 2537	15 - 2551	AI927678, AA232725, AI633723, AI333470, AA779999, AI816902, AI022001, AI434446, AI056039, AI925006, AI288255, H29661, N47100, AI124781, AA206869, N34544, H15466, AI674776, AI479295, AI419277, AI246156, AI375207, N62861, AA315242, AI250185, AI861879, AI184068, AA325690, AW016675, AI283674, AW304435, T79977, H50315, AI266406, W26725, F01086, R69275, H29577, T83389, AA657840, T81576, W24823, AI084936, AA905914, AA736793, R69161, R12256, F05440, T97379, AI627522, AW300235, AA885377, AI419677, AA206868, F00267, AI425106, D56584, R16708, T97268, H15410, AI904285, N67285, R39343, AA308742, F05501, F01702, AA236518, AI804415, X66366, AF174130, AL049835, AL117667, and AL049779.
HCGMG56	118	953660	1 - 694	15 - 708	W81261, AW051303, AI160442, AA156841, W05636, AI949608, AA458523, N36565, AI188724, AI147464, AI808171, AI193857, AI675163, AI417410, AI149310, AI126861, AA151036, AI333419, AA025956, AI159779, AA987272, AI203946, AA150985, AA772316, AA779534, AI088553, AI190133, AI147633, AI148793, W81335, AA723186, AW404642, AI128528, AA889980, W69555, AW247091, AI091251, AA525973, AW273369, N80199, AA813501, AA526626, W03593, AI494503, AI015920, AI347389, AW136090, AA150938, AA150928, N67749, W81336, AA373044, AA716232, N32922, W88848, AI160615, AA025768, AA730333, AA536057, AI023538, AA341135, W69266, AI022607, AA318712, AA641289, AI004543, W38490, AA806495, AW265401, AA962262, AA774485, AA516362, AA503958, AA344784, AI022762, AI635460, T30218, AA992404, AI675588, AI283855, AI636840, AI262717, F35937, N77883, N42066, R21493, W88752, AI185384, AA513218, AA579739, R42876, AA355413, W81193, T16491, AA543048, H22398, AW079571, T05161, F34997, AA889985, AI269143, T20101, AI674400, AA973177, AC004707, AC004707, and AC004707.
HNGBQ66	119	966001	1 - 1940	15 - 1954	AW239349, AA075198, AW089835, AI249014, U56656, AA602491, AA602490, AA148805, AA375315, AI248362, AA355780, AA857449, AA857800, AI625310, T93052, AA046175, AI355290, AI246624, AI952649, AA910993, AA705614, AA213680, AA640285, AI435592, AA256651, AA213638, AI983332, AI310880,

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HTXPY09	120	966013	1 - 1144	15 - 1158	AI435592, U56656, AA148805, AA046175, AA075198, AF194371, AF069782, AF053232, AF123534, AL117554, and AF161469.
HCHAS12	121	966626	1 - 1375	15 - 1389	AI539386, AI190303, AA868538, AI219986, AI345954, AA988977, AI309975, AI200426, AI338679, AI720044, AI148589, AI827995, AI829710, AI807471, AW268605, AI202768, AA932930, AI808710, N37092, AI091541, W74439, AI436105, AI332422, AI222787, AA865258, AA883578, AI830140, AI536845, AA435561, AI476645, AA436117, AI393567, AI742423, AI991280, AI040961, AA976254, AI911731, AI204236, AI684261, AI807161, AI798704, AI091532, AW001083, AA776717, AA906270, AI286196, AW084515, AA884285, AA884231, AW195890, AI203679, AA843421, AI142135, AA393148, AI149711, AI167652, AA917965, AA758038, AA846787, AA923373, AA740667, AI936554, AW043785, AA994527, AA725406, AI243219, AI083755, AI200425, AI291760, AW269733, AA456074, AW391262, AI833323, AI311479, AW304042, AI243370, AA777492, AI694334, AI027967, AA910051, AI167246, AI031908, AA757222, AI025986, W58740, AI091504, AI679583, AI688130, AA758549, AI935008, AI318065, AA972041, AA962659, AI083851, N29346, AW188625, AA897637, N40362, AA996162, AA748637, AI241349, AI150116, AI799122, AW166483, AA971938, AA884703, AI807973, AI243421, AI347903, AI024835, AI025228, AW183835, AI798180, AI858097, W79084, AA875917, AI276559, AI493367, AA410432, AA905015, AW371415, AA904368, AI284271, AA505880, AI743644, AA305510, AA938552, N26589, N27547, AI911350, AI377383, R23891, AI187351, AI214377, AW082764, AA843427, AA954722, AA954270, W00472, AA412317, AA740333, AA455577, AI971480, AA305179, AI216245, AW085014, AA977877, AI689289, R65987, AI220007, AA099550, R76814, R65986, AA815444, AI698618, AA835882, AA969436, R83423, AI198119, AA861386, AI168675, AI160545, AA815351, AI269132, AI243242, AI223152, H02479, H72396, AA970621, AI762065, R71169, AI289227, AA952918, AA999722, AA305134, AI205806, R23890, AI215980, AW082794, AA927156, D60944, AW137925, AA928243, AA912408, D61030, AA890154, AA758323, AA932728, R63480, H01351, AA972542, AI216504, R63278, AW135447, AA885425, H12460, AA628621, AI272123, R89052,

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H6EDI12	122	1154053	1 - 836	15 - 850	AA722724, AI972007, AI284131, AI636619, AI540606, AI624304, AW074274, AI797794, AI886206, AI955906, AW029349, AI473451, AI888621, AI291973, AW084097, AW168709, AI886192, AI683590, AI698401, AI860691, AI568060, AI521244, AW088903, AI446405, AI874151, AI452556, AI683463, AI632033, AI378123, AI498579, AW118332, AW026425, AI092027, AI281867, AA493923, AI580674, AW195969, AI868163, AI859880, AW058279, AW078805, AI345347, AI571699, AA494167, AI499986, AI784230, AI798501, AW151136, AW089689, AA468418, AW081255, AI343059, AI885989, AI349933, AI345608, AW007939, AI890057, AI345253, AI953438, AW148320, AI690751, AW403717, AI446003, AW196105, AI521476, AI860897, AI336503, AI922577, AI348854, AI345471, AA449768, AI678446, AI679728, N22406, AI619754, AW128945, AI272116, AI697321, AW183601, AW088134, AW089006, AI702301, AI636719, AI433384, AI916419, AI571873, AW082600, AW168503, AI799195, AW058233, AI627880, AI872423, AI805688, AI625237, AW082088, AI348917, AW161202, AI249946, AA019646, AW148590, AI933780, AA635382, AI564426, AI434020, AI929108, F26535, AW080723, AI873638, AW409931, AI565172, AW089275, AW193911, AI623736, AI570056, AI349957, AI500662, AI927755, AW082033, AI559619, AI345005, AI784214, AW263569, H89138, AL036718, AI537837, AI620093, AI282743, AW162189, AI252813,

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HE8MI76	123	911474	1 - 947	15 - 961	AA313731, AI752306, H29716, AL042709, AA360323, AI082737, Z20973, AA332646, AI052306, AW305203, AL119510, AL119412, AB018271, and AL137008.
HSDGJ23	124	714160	1 - 392	15 - 406	
HHSAD81	125	602854	1 - 594	15 - 608	AI590557, R68404, and AC004622.
HCEEZ56	126	1171692	1 - 1726	15 - 1740	AA283155, AI041082, AA282986, AI082687, AW403360, R53658, T16349, AA677984, R53547, AI264476, AA345142, AI498326, R36905, AA227450, AA918259, AF196968, and AW614362.
HE8TT33	127	1189455	1 - 3518	15 - 3532	AW409918, AA555102, AI003522, AL043031, AA630416, AI948578, AW337170, AW167070, AW273765, AA594053, AI569275, AW273196, AI831256, AW305101, AI687711, AI831600, AI138558, AA496831, AI720563, AA862433, AI313149, AW078880, AA533096, AA779221, AW067833, AA948345, AW273465, W58044, AI937816, AI281213, AI679632, AI952028, AI760519, AI865162, AW246361, AI302423, AI343733, AA706415, AI123673, AI760685, AI440246, N40557, AI281253, AA313629, AA831725, AI086766, AA961667, AL046656, AA716744, AA496873, AA847610,

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HAGBX32	128	951351	1 - 624	15 - 638	W29095, H04905, H11833, AF100346, and AC004125.
HLWEE80	129	1202534	1 - 1363	15 - 1377	AI609398, AI278617, AA621655, AA868455, AI081552, AI290739, AI608719, AI567964, AA421224, AA421214, AW193527, AW009516, AI754809, AI022091, AA868840, AW001133, AI376946, AI735188, AI689150, AI743002, AA993670, AW009876, AA911941, AA888156, AA830904, AI277633, AA602889, AA579086, N40529, AA449842, AA843194, AI241348, AA873585, AI273254, AA947889, AA830858, AI090471, AA425965, AA989498, AI300301, AA612762, AI284299, AA550844, AA488241, AA602504, AI026923, AI190110, AA993166, AA421945, AA429053, AA622170, AW250093, AA468742, AA610770, AA078825, AW250846, AI018058, AA410582, AA421946, AI301856, AA683333, AA402945, AI350362, AI753847, AI080736, AA216765, AW403534, AA443534, AA460139, AA847314, AA468762, AA662376, AA476292, AA429082, AI268605, AA581663, AA155589, T70058,

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HMEFI81	130	1226739	1 - 4159	15 - 4173	AI073560, AI201459, AA527879, AA700382, AA777810, AA286925, AA151678, AA418754, AI637549, AA778792, AA983573, W80620, AW103826, AA932949, AA418693, AI829622, AA703112, AA151758, AI131357, AA846135, AI568518, AI124085, W04420, H54635, AA583784, AA960837, AA585439, T87505, W78994, AI200626, M79159, N76001, H53519, H53520, R16415, H54636, AA585453, AI535639, AA585440, AI525556, F11222,

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HOUHW83	131	1199942	1 - 2690	15 - 2704	AL042853, N88564, AI270117, AW274349, AL046409, AI431303, AI284640, AI963720, AA521323, AI732865, AI696962, AW419262, AL044940, AL119691, AW303196, AW193265, AI281881, AW301350, AI613280, AI334443, AA521399, AL046205, AL138455, AW410400, AI110770, AA720702, AL041690, AA491284, AL138265, AA610491, AI254615, AA828704, AA526787, AI754658, AA665330, AI799642, AA581903, AI064864, AI133164, AA908687, AW265393, AI623720, F36273, AI350211, AL037683, AW020340, AA468022, AI355206, AW276827, AI679782, AW407578, AW004911, AI889781, AI865905, AA631507, AW238278, AI076616, AL039958, AW072587, AA490183, AA649642, AI341548, AW028429, AI561060, AI370074, AI473943, AL042756, AA164251, AI801591, AW270382, AI149478, AI587583, AL045053, AI587565, AI289067, AA682912, AA723017, AW276435, AI821271, AW302013, AI559705, AA877817, AA101689, AL048626, AI368745, AL119649, AW169151, AI358501, AI499938, AW085740, AI270559, AI821714, AI792133, AI791913, AI370094, AI085719, AI471481, N53150, AW438643, AI969436, AA394271, AA832181, AA456976, AW072923, AI709365, AA847499, AI345157, AA613345, AI344812, AA469451, AI192631, AI619997, R24205, AW408717, AW088202, AI570261, AI358571, AI830390, AW265170, AW103758, AI814735, AW083402, AW131249, AI499503, AA126051, AI053672, AA126035, AW406447, AI798473, AI733755, AI801482, AW338086, AW162049, AA579179, AI871722, AA947360, AA583955, AI929531, AA402129, AI654588, AA515224, AW070892, AW073470, AW029038, AA613203, AA613227, AA455483, AI564284, AW020992, AI376100, AI821785, AI708009, AI921649, AW245747, AL042420, AI379719, AA584167, AI653636, AI305766, AI801600, AL038474, AW406755, AA469327, AI633025, AI624142, AW270270, AA178953, AW023672, AA192740, AL119984, AA482711, AI625244, AW148792, AA491814, AI453383, AW439558, C06327, AI161293, AA719292, AA594145, AA502103, AW406162, AA515909, AL044858, AL038785, AL045077, AI860020, AI281903, AL048925, L14684, AF015149, U18395, AC006561, U95742, U18398, X55925, U18393, I51997, AC007216, U57005, AF077058, AC004066, AC004741, U18392, D83989, AF015147, AC007237, AF015157, Z84718, X55931, X55924, U18387, X53550, AC007848,
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HSLCB60	132	1193050	1 - 1537	15 - 1551	AW062391, and A14709.
HSLFG64	133	1228145	1 - 2976	15 - 2990	AI526148, and L29346.
HTPFX16	134	974296	1 - 470	15 - 484	
HWAER24	135	934693	1 - 2706	15 - 2720	AI073560, AI201459, AA527879, AA700382, AA151678, AA777810, AA286925, AA418754, AI637549, AA778792, AA983573, AW103826, W80620, AA932949, AI829622, AA418693, AA703112, AA151758, AI568518, AI131357, AI124085, AA846135, W04420, H54635, AA583784, W78994, AA960837, T87505, AI200626, M79159, H53519, N76001, H53520, R16415, H54636, F11222, N90636, AA442473, AI538798, F08885, R02437, R02334, AA994060, AI247499, AA436664, and AI222259.
HKMAC08	136	1121865	1 - 710	15 - 724	AW160584, AW162850, AF175406, AF063825, AF063824, AF063823, AF063822, and X99792.
HSLHS93	137	1105323	1 - 377	15 - 391	
HBGOT10	138	963457	1 - 423	15 - 437	E01360.
HSDJW73	139	882817	1 - 617	15 - 631	
HWMEQ37	140	949568	1 - 853	15 - 867	D31382, AI927431, AI380837, AF216312, and E13203.
HFRBX44	141	1107898	1 - 2209	15 - 2223	U59490.
HRDDR74	142	1103362	1 - 1066	15 - 1080	T69052, AI557293, W32034, AW360811, AW177440, T03269, AW375405, AW178893, D59275, AW179332, AW366296, C14389, AW179328, AW375406, AW378534, D58283, AW377672, AW179023, AW178905, D59859, D80022, C14331, D80166, AW177731, D80195, D80193, D59927, D59467, D51423, D59619, D80210, D51799, D80391, D80164, D80240, D80253, D80043, D59787, D80227, D59502, AW378532, AA305578, D80038, AW377676, AA305409, AW352170, AW178907, AW178762, AW178908, AW179019, AW178906, AW178911, T48593, D80439, D80247, AW378528, D80132, D80134, AW378533, C06015, D45260, C03092, AA285331, AA514184, AI525913, AJ238764, AF051852, AF155663, Y07744, AJ132236, A84916, A67220, D89785, A62300, A62298, Y17188, AB028859, A78862, D34614, D26022, AJ132110, AR018138, AR008278, X67155, Y12724, AF058696, A25909, I50132, D88547, I50126, I50128, I50133, A94995, AR066488, X82626, A82595, AR016514, AR060138, A45456, A26615, AR052274, AR008443, Y09669, AR060385, AR025207, AB002449, D50010, AR066487, A43192, A43190, AR038669, A30438, Y17187, D13509, A63261, A70867, AR060133, AR008408, AR062872, I18367,

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HPIAQ70	143	1151503	1 - 552	15 - 566	
HROAZ07	144	973603	1 - 502	15 - 516	
HTTER50	145	1220586	1 - 1268	15 - 1282	R90889, AA322680, N91406, and AF077032.
HUFBV44	146	1220585	1 - 2498	15 - 2512	AW237290, AI016073, AI633654, AI480414, AI741813, AI694646, AI870003, AA741322, N49686, AA001286, AA195332, AW241614, AW105043, AW440337, AA987206, N50814, AA001142, AW340366, AI383472, AI040221, AI857324, H97009, AI440186, AI362748, AW293140, AA001923, AA812049, AA355299, N69378, W78919, AA769267, AA490844, H66481, AW338758, H08410, AI571634, H08409, AW295825, AI141531, N62515, AA195333, T98178, W78825, H61192, AA641777, AA001947, T98177, AW081085, N49789, T90989, AI560764, N50467, R10846, R01438, H65509, AI276915, AI559361, R01437, N79412, H66482, T79031, W94269, AL037558, AW473166, AW571578, AW572241, and AW612505.
HE2EI69	147	534587	1 - 437	15 - 451	
HWMJR63	148	1152429	1 - 990	15 - 1004	AW340658, AI830575, AI970997, AI375239, AI955746, AA452348, AA505698, AA452125, AW403701, W52045, AI742513, AI199971, AI338181, AI338219, AA926692, AA938400, AA644138, AW402946, AI344126, AI186703, AI183773, AI675706, AA156689, AI300753, AA884026, W60021, W38892, N95054, AI148098, H01993, W44927, AI751818, AA805553, AW170013, AA954291, AW150567, W39574, AI864148, AA280408, AI494112, H04586, R27968, AI193848, AI078102, AI936538, H39712, AI198333, AA194406, AA094826, H02089, AA363376, AA642334, R28221, T94680, AI373118, AA280407, AA994085, AI352072, H13826, AI818830, AA918331, AA554306, AI093632, AA447655, AI276589, AI273430, N30561, H28693, AA134664, AI278504, AW341382, H13182, AI934888, W24049, H13867, AA919107, and AF169284.
HSLFD83	149	667155	1 - 352	15 - 366	
HBKDA90	150	912285	1 - 805	15 - 819	
HTLAA37	151	754641	1 - 329	15 - 343	AC005546.
HTRAA36	152	756908	1 - 747	15 - 761	
HRGDD16	153	877117	1 - 377	15 - 391	AI905014, AL040212, and AC005546.
HNSAB28	154	881286	1 - 1128	15 - 1142	AL118633, AW175806, AI909009, AA033651, AW391350, AA287796, R01351, AA032243, AA515416, Y08565, AJ133523, AC010188, and AC010188.
HTTEP70	155	917729	1 - 948	15 - 962	AW249443, AA682998, AW404364, AI961145, AA349769, C17472, AA350606, AA377837, AA380720, AW024225, AI498715, AA360525, AL040211, Z42503, AA176150, AC005546, AC005546, and

HMSII43	156	946985	1 - 657	15 - 671	AC005546. AI807817, AI241225, AI497916, F06544, D31247, N56216, AA428123, AA339686, AA287075, AA410717, T78145, W69382, W69383, AI167280, H75982, F05840, D31349, AA419308, AA404625, N41831, AI344817, AI282326, AW403717, AI696626, AI274769, AA225339, N80094, AI251205, AI619716, AA427700, AI318280, AL039086, AI309401, AL036214, AI343112, AL036980, AI349598, AW023590, AI345735, AI340582, AI699011, AW161579, AI252023, AL120853, AW302988, AI343059, AW102785, AW103893, AI561299, AI476109, AI923768, AI635464, AI608676, AI446003, AI349933, AI888953, AI868831, AI250663, AI886124, AI689175, AW084219, AI933785, AI633419, AI554218, AI866002, AI431909, AI433976, AI828731, AW079159, AI687065, AI612759, AW089179, AI610645, AW151729, AI269696, AI867042, AI696819, AI344928, AW103371, AI280661, AI537617, AI680498, AI919345, AW088899, AW089518, AI366549, AI362637, AI636719, AI539153, AW150578, AI648663, AI866608, AI611743, AW082594, AW083804, AI589993, AW238730, AL119791, F37471, AI800433, AI498579, AI445165, AI963216, AA814407, AW149227, AI284131, AI097248, AI648684, AI344933, AW190042, AI922676, AI590120, AI922901, AW068845, AI249962, AI610115, AW074993, AI494343, AI349614, AW268220, AW073994, AI468872, AI889953, AI334450, AI364788, AW088903, AI829327, AI520702, AI680162, AW051107, AW268253, AI888944, AW088134, AW162071, AI312152, AL041772, AW235745, AI539771, AL038605, AI859464, AI554245, AI348897, AW081255, AI307708, AI251830, AL036631, AL040241, AW082040, AL079794, AI620287, AI929108, AI446373, AW169634, AI916419, AA640779, AI349937, AI349645, AW071417, AI537677, AI491798, AI590423, N71180, AI370390, AA493923, AW059713, AI312428, AL045266, AI572418, AW075084, AA494167, AI921176, AI539028, AL036403, AI345608, AI554427, AI345224, AI569583, AI269862, AL038445, AI313320, AL045163, AW263979, AI648502, AI336575, AI799199, AL038565, AI862144, AI284509, AL121328, AI345471, AI873644, AI805638, AI366992, AL036215, AL120854, AI811168, AI499652, AI564719, AI281772, AI572892, AI889376, AI567351, AI800453, AL046926, AA287231, AI524671, AI608936, AI521012, AW059837, AW051258, AI812015, AI569309, AI921248, AI924971, AI922577, AW151785, AI611738, AI207510, AI571909, AI619502, AI677796,
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HMADV11	157	920770	1 - 416	15 - 430	
HNTCK35	158	1226201	1 - 3845	15 - 3859	AA196347, AI972907, AI798906, AW006190, AI951558, AI521165, AI937074, W72702, AA609417, AI791375, AI564706, AI142337, AI143225, AW303829, AI146777, AA829913, H17764, AI161337, AI192949, AA862277, AA688099, AI090807, AI948438, AW175962, AW263020, AI859167, AA948215, AI826140, AA854164, AI192234, AI360480, AA558454, AI598133, AA130443, H06325, AA603668, AI288828, AI220002, W52518, AA112031, R53537, W49527, AI267289, AA478207, AI017662, T59701, AI219669, W77942, AA057465, W49528, AA130442, AI580291, AA668787, AA193008, AI698736, H20710, AI266704, AA192624, R59691, H57299, AI214274, AI247660, AI888165, Z25084, H06279, R59631, AI076244, H93660, W20416, AA046167, AA678302, H15989, R53648, AI081111, Z24882, H10591, AA731842, AA932849, AA603080, AI127430, H93661, AA782406, AI290516, T51584, AI536630, AI245065, AI473591, AI795819, F30895, H57300, Z42230, AA863278, F31510, AI795811, AA523927, AA045850, F33254, AI147328, F35916, AI924270, Z28618, AA413403, R36809, AI024519, AA883966, F25758, AW380084, F29690, AA782858, AC005523, AF064447, AC005048, AL022147, AL110197, Z49258, Z37987, AC007392, and Y17327.
HTPGQ16	159	1027781	1 - 878	15 - 892	AI962647, T69166, AA585439, Z28355, AI541374, AI546855, AI525556, AI541510, AI541514, Z30131, AI546999, AA247800, AI525306, AA585101, AA585453, AI541534, AI541523, AI546828, AI526140, AI525316, AI556967, AA585434, AI535639, AI541509, AI525431, AI541017, C15189, AI526194, AI656439, AI547039, C16300, AA585440, AI546945, AI557799, AI541365, AI557807, AI540967, T11028, AI541535, AI541307, AI557731, AI546899, AI526180, D61254, AI557787, R29445, R28735, AI526196, AL040510, AL040625, AL045817, AL041142, AL041238, AL041133, AL047183, AL040322, AL041131, AL046330, AL041051, AL041292, AL040119, AL047036, AL047170,

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HOCMS18	160	1227594	1 - 3720	15 - 3734	AA115295, AI983849, AA873315, AL049024, N36273, AA625435, AA780019, W44645, AI926527, AA551576, AW149789, AA873307, W84522, AW303776, AI355170, N31714, AW069314, AA599312, AA969227, AA534678, AA676593, AI338244, AI460358, N31721, AI366135, N42400, AI127202, AW021988, AI753611, AI926969, W44644,

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HE8AM58	161	1204936	1 - 1597	15 - 1611	AA331573, D49658, AJ000338, AB007596, AB007595, AB007590, AF220000, and AB007594.
HUSGZ51	162	955542	1 - 420	15 - 434	AW410914, AA314782, AA315619, AA307196, W42974, AA221000, F12658, AA148973, AA121597, AW179125, AA205790, T74241, AA353399, AA151174, N40506, AA339272, AA209384, AB026125, AC018568, and AC018568.
HELEQ48	163	960866	1 - 486	15 - 500	AI591223, AW025351, AW243247, AW148715, AW206432, R43019, M79245, AI768009, AI282406, AA297699, AI566825, T31578, H30370, AI873011, AI468048, and AB002361.
HOFOE03	164	1226251	1 - 3702	15 - 3716	AF150275, N32051, AI249187, AF002216, AI133188, AI539493, N42445, N21001, N25798, H99881, AL079717, H79945, H80726, H83090, AI565587, H82871, H80725, AW075744, AJ133831, AI338158, N36506, N28567, AW385286, and AB002377.
HNFFR23	165	585289	1 - 346	15 - 360	AC008751.
HOGCC57	166	1205511	1 - 803	15 - 817	AA411425, H58696, AI817007, AI419471, H58306, AA931895, AA885801, AL042606, AA770619, AA877086, AI086358, AA558122, AI247400, AI198553, AI142274, AI147991, and AR044120.
HFOZC96	167	926685	1 - 698	15 - 712	AI589776, AI057117, AW272585, AI246523, AA767227, AI625485, AA873003, AI239712, AI955774, AW296331, AI741538, AI479753, F32315, AI674694, AI932376, AA804789,

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HOHBK44	168	823872	1 - 514	15 - 528	AI133188, AL079717, AF002216, AJ133831, AI338158, AW385286, and AB002377.
HHHERB37	169	708477	1 - 444	15 - 458	AI146685, AA085407, AI745120, AI262886, F06929, F30111, F35773, F07397, AA090959, W05535, F21145, N87462, F12448, AA243832, T74070, R57608, AF088982, AF088983, AF092536, AC005259, and AL355377.
HEGAW40	170	710652	1 - 674	15 - 688	AW006873, AA627973, AI138661, AA741125, AA749030, AI685305, AA813972, AA748557, H99202, AA227998, AI796325, W02040, AW137937, AA227824, AA768499, AA215600, and W32239.
HDTDQ51	171	1152264	1 - 1504	15 - 1518	AI016714, AW391661, AA847865, AI554330, AA483400, AA483411, AI051725, N66755, AI825794, N62194, AW327616, AA902896, AA725234, AI769182, R60056, AA594900, AA933624, H05474, T16298, AA977118, R60119, H07025, AI671131, AA054722, AA650410, AA469117, AI815393, AA740290, R43427, N76491, AA761969, AW327262, AA716570, AA916000, T34734, AA112320, N29491, AI435962, AA478943, AA443197, AW377345, N31578, AW377295, N99049, AA029980, AI263863, AW377378, AW377297, AW377218, AW377231, AA805766, AI499056, T90105, AA659890, AA054669, AA342241, AA811545, AI091066, AW393506, F03954, and T82929.
HOHCG42	172	1152272	1 - 921	15 - 935	
HOVCC60	173	718918	1 - 792	15 - 806	T66088, R20466, H28845, F11782, R36030, R54148, R17605, H19122, Z44635, Z42554, R17616, and N50384.
HMVAC92	174	731732	1 - 454	15 - 468	C18294, AA115838, W76458, T32095, T30710, AA378552, AW360837, R08104, W23225, T35980, N45490, AI554624, T35790, AI313133, T84898, AW391980, Z20579, AA357067, T35190, AA310762, AA328222, R15571, AI205283, AA035103, AA448769, AA214347, W38702, N56257, AA116099, AW401574, AW411042, AA371686, AA452303, AI570120, AA613412, W61124, AA093588, T63232, AW368742, AA868496, AW338692, AW167217, AI954547, AI955639, AA079294, AA478499, W24470, R70678, AA657656, AA166897, AA453225, AA341741, AI697147, T16000, AI921707, AA894909, AA551115, AF128527, AF126181, AF128528, U92544, Z98046, AB029037, and A75460.
HWGAF89	175	742053	1 - 736	15 - 750	AL135068, AA461053, AA460486, T67180,

					AI628805, AC007041, and D87078.
HHBEG78	176	969106	1 - 444	15 - 458	AA194446, AA194603, and U76618.
HPMJT61	177	1152422	1 - 1367	15 - 1381	AW409700, AI333316, AA456955, AI970049, AI381634, AI741903, AI420038, N76926, AI674975, AW444456, R42051, AA680112, AW023699, AA358453, N55540, H50735, AW020342, AA457064, H50647, AA479171, R20871, AI468658, and H56974.
HKAED89	178	827573	1 - 527	15 - 541	AI830569, AI689270, AW339088, AW137765, AI660157, AW206080, AW139670, AA747810, AI066685, AA741078, AA593017, AI364910, AA743755, AI214128, AF038458, and AF038458.
HHAMA35	179	850272	1 - 1327	15 - 1341	AA648933, AA742244, AI739536, AA393227, AA812029, AA424400, AW368992, AA424474, AA724544, AA416925, AA261812, AW390517, AA100143, AA372643, W23989, AW403227, H94816, AA313329, AI829684, W58474, AL043108, AA165152, AA091310, T10404, W52177, W48807, AA843784, T28111, and A93912.
HRADJ08	180	1179715	1 - 2483	15 - 2497	AW341277, AA442905, AA449052, AA677433, AI375482, AI393099, AA649052, AI913346, AI859698, AI417958, AI373524, AI769760, AW271751, AI685790, AW243463, AI684073, AI670074, AA470724, AI344642, H12220, N76222, AA701021, AA758141, AW029224, AI040528, AI376742, AA693735, AW296327, H42313, AA464605, AA835707, T26462, N54520, AA121186, AA758284, AA430532, AI470967, AI565321, AA121187, N50674, AW193102, AA885708, AW079408, H30000, T26463, T17007, Z40783, AA887660, AA373205, C05171, AA918565, F07717, H43079, T99533, R20437, H30001, AW020286, AA665044, N50763, H46108, AA374682, T99427, R43557, AI368375, AI915506, AI913702, R95437, D79994, AL035461, and L10617.
HLVAN64	181	867366	1 - 1992	15 - 2006	AI821213, AI821209, AI807218, R51319, AI983657, AI937338, W07708, AW444958, AA805535, H41438, AI732196, AI344897, AI144038, AI807212, AA582540, AA600981, AI349626, AA707347, AI589436, AI140382, R51431, R49133, R36051, AI732193, AA745702, AA468776, AW271143, N80586, AA976044, AA468630, AI865638, AA838544, AA077645, H51527, AA326999, AA295306, AA337557, AI053787, AW271014, AI800018, AA338692, AI567011, AI312040, AI744268, AI863002, AI499570, AW008226, AA767177, AW079640, AI817492, AI249877, AI540179, AI633125, AI804531, AI653402, AI473536, AI250852, AW410416, T69241, AI247293, AW089844, AI539690, AI561228, AI620864, AW163554, AI633061, AI635634, AI696714, AI678446,

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HTLHP64	182	883120	1 - 1015	15 - 1029	AA243884, R55643, R55421, H42362, and N75418.
HNTCI60	183	890754	1 - 796	15 - 810	AL046248, AL046015, N92391, W24708, AA130104, AI905673, AI905674, and AC020663.
HUCMU74	184	899751	1 - 786	15 - 800	Z99396, AL038837, AL037051, AL036725, AL036418, AA631969, AL039074, AL039085, AL039564, AL036858, AL039156, AL039108, AW392670, AL038509, AL039109, AL039128, AL036924, AL037094, AW384394,

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HWWT02	185	908017	1 - 815	15 - 829	AI554691, AI159923, W57638, AW182099, AI819209, AI003931, AI805914, AC004188, AB014086, AP000516, AB014086, AB014086, AC004188, and AC004188.
HSKDU47	186	1154797	1 - 730	15 - 744	AA431523, AA171452, AW138802, AI738771, AI809942, AI826110, AW452200, AA745516, AW002570, AA908687, AI341458, AI284640, AL119691, AW270382, AA351056, AA828749, AW028392, AA491831, AW075948, AI554718, AI473943, AA737432, H56509, AL042853, AI281881, AW238278, AW021207, AI567832, AI633025, AA724333, AA662225, AA808877, AA531186, AA577959, AI377567, AI377556, AA713891, AI377505, AI754336, AA788982, AW103758, AA938105, AA640772, AA652764, AA679532, AA679936, AA486559, F29184, AA525892, AA661814, AA630362, AA847952, AI537077, AA578391, AI932599, AA594145, F27407, AI873852, AI873761, AA491284, AL137614, X55931, X54180, AL031390, X55923, Z93017, U49740, AL035455, AP000298, AL031295, AC004099, AL049569, AC006063, AL035671, AF039907, AC005295, Z84469, AC004884, AC002984, AL133245,

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HODFI03	187	918008	1 - 1392	15 - 1406	AL036125, AI925441, AW363137, AW238419, AL043697, AL043698, R99060, AA781204, AI588883, AL135068, R99049, R62711, AA853740, AI337325, D87078, AC007041, D43951, AC007041, AC007041, and AC007041.
HWHHR02	188	919169	1 - 884	15 - 898	AI453533, AW003844, AI797910, AA161335, AA833762, W49529, AI356252, AI863269, W49530, AI422074, AI087203, AI348189, AI080077, AI292023, AI359963, AI278825, AI700817, AW452178, AI223214, AA861082,

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HSVBQ03	189	924850	1 - 340	15 - 354	Z24798, AI984000, AI376738, AA853182, H57665, AI801497, AA889345, AW269830, AW385653, AI469976, AI951239, AW385674, AI470014, W70229, AI090780, AI460194, W44651, AA913912, AI352112, AI277888, AI277222, W70230, W44650, AI299070, AI147785, AI141926, H58505, AB037938, AC004477, and AC004477.
HSLCQ10	190	1153914	1 - 1045	15 - 1059	AW079850, N34064, N64316, AA346933, R63682, R62727, AI525343, AA206737, AA418089, and AA249010.
HKACQ38	191	975382	1 - 1578	15 - 1592	AI589776, AI057117, AW272585, AI246523, AA767227, AI625485, AA873003, AI239712, AI955774, AW296331, AI684523, AI741538, AI479753, AI674694, F32315, AA804789, AI932376, AA993510, AA044610, AA243346, F36914, N55553, AI961836, AA262732, AI927868, AI127216, AA720891, AA953487, AA324979, AA262814, R86959, AI862200, AA039578, AA487796, AI886998, AA243547, AA485892, AA042797, AI685404, R05274, AA326305, AA912800, N76938, R75748, F18062, C00227, AA747721, R05331, AI554396, N29277, AW303152, AI345778, AW132056, AL079963, AI659795, AL135517, AL120853, AI932953, R36271, AL036631, AI312428, AL039086, AI340519, AI340603, AI627988, AI801325, AW020693, AI611743, AI537677, AI633125, AL048656, AL110306, AI348854, AI696819, AW022682, AI929108, AL038605, AI364788, AI559619, AL041772, AI345740, AA814407, AI700159, AA658033, AW300889, AI344785, AL042377, AW023338, AI445992, AA420722, AI953562, AL036638, AI345370, AI288285, AL121286, AI620284, AI345608, AW303089, AL036980, AI499986, AI494201, AL036274, AI334450, AW403717, AI500523, AL037454, AW302965, AW020419, AI340627, AI609128, AA640779, AL036403, AI468872, AL119863, AW081143, AW238730, AA613907, AI436576, AW083804, AA572758, AL038505, Z99428, AI916419, AI254727, AI336575, AL118781, AI476376, AI249497, AL037030, AL045500, AI269862, AI309401, AA579232, AW068845, AA635382, AI567582, AI815232, AI610645, AI783504, AW162194, AI349645, AW302992, AI923989, AI284517, AI500061,

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HE9GZ52	192	964579	1 - 440	15 - 454	AI372490, AB020640, Z98884, AL359881, Z98884, and Z98884.
HSYBD55	193	1197348	1 - 619	15 - 633	R57737, AI375137, C03950, and AF116826.
HTAJM37	194	1152423	1 - 882	15 - 896	AI863425, AW005342, AA916533, AI932220, AI564040, AA953376, AI985590, N69484, AI439698, N90977, AL041573, AL121286, AL079963, AI815855, AI570861, AL110306, AI929108, AI698391, AI802542, AL036638, AA225339, AL037582, AL037602, AI554344, AI537677, AI174394, AA427700, AI475371, AL119863, AL040456, AI590686, AW087445, AI798456, AI824576, AI499285, AW083573, AW022682, AI632408, AI920782, AW169604, AL119791, AA287231, AL121365, AI890223, AL037454, AW189802, AA572758, AL045620, AI635067, AI521012, AI281867, AL038445, AI801325, AI251221, AI802654, AW238730, AW167918, AI554821, AI683492, AL047172, AI565128, AI445990, AI564723, AI274745, AI832245, AI439762, AI934035, AL036631, AW148970, AI635492, AI468872, AI270183, AL138457, AI570807, AW243741, AI254731, AW152000, AI866780, AI679211, AI866770, AA464027, AL135661, AI699011, AI345416, AI345612, AI497733, AI619716, AA493923, AI470651, AI873644, AW269097, AI334445, AW059828, AA640779, AI445992, AW072588, AI345415, AI874166,

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HSDJH63	195	941120	1 - 1385	15 - 1399	AA741118, AW451491, AA252360, AA252405, AC006252, AC006252, AC006252, AC012224, and AC044892.
HNNAG23	196	1137691	1 - 495	15 - 509	U46349, AW392670, U46346, AL119355, AL119341, AL119319, AL119457, AL119483, U46351, AL119324, AW372827, AW363220, U46350, Z99396, U46347, AW384394, AL119443, AL119484, AL119363, AL119391, AL119444, AL119497, AL119439, U46341, AL119335, AL119522, AL119418, AB026436, AR054110, AR060234, AR066494, and A81671.
HYAAL21	197	943135	1 - 1890	15 - 1904	AW328507, AI655972, AA523409,

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HPBCF69	198	946469	1 - 676	15 - 690	AA298316, AA431938, and AL022101.
HWDAE40	199	947007	1 - 2166	15 - 2180	AF150174, AI417513, AI698235, R56970, AA471187, AC008917, AC008917, and AC016605.
HUVHH77	200	948377	1 - 1550	15 - 1564	AL119101, R60392, T85035, H07958, AI751941, R55083, AA330057, T91983, AL132641, AB007865, AF169676, AL132641, AL132641, and AL132641.
HTLIT03	201	966870	1 - 890	15 - 904	AA886893, AA862723, AA470745, AA928557, AC004531, AC004531, AC004531, AC009077, AC009077, and AC009077.
HUJDA09	202	951526	1 - 767	15 - 781	AI133670, W26633, AW375605, AA318069, AA853744, AI174232, AA521255, AA024888, N46555, R58116, AA447471, H77993, R58328, T47555, AI205304, T81235, W25885, R33242, AA349799, Z20968, AA206898, AW380305, AA852419, AA355036, AW352357, AA486937, T80568, AA350303, AW138906, AA533322, W22449, AI372724, AI751908, AL133628, AF124440, AJ133038, and AB029448.
HTEPU67	203	1152262	1 - 1556	15 - 1570	AL046221, AI971610, R72491, AI399742, AA426607, R81472, AI828470, AA247827, AL049014, AL041370, AL041369, and AB033049.
HULFJ52	204	952928	1 - 1069	15 - 1083	AW248392, AW269526, AW007505, AA873566, AA777631, AA868719, AI095590, AW044220, AA935632, AI017929, AW166336, AA310175, AI889052, AI598144, AW328519, AW328518, AA831482, AA417135, N33459, AA618021, AA313368, AA868795, AA993399, AI083718, AI016702, AA459170, AI302612, AI160021, AA600754, AA447569, AA961682, AI285263, AI720708, AA860514, AI220450, AI469794, AI014825, AI301635, AI248971, AI128630, AA833995, AA875886, AI161342, AA936142, AI873496, AA476531, N35132, AA508601, AA883939, AI032546, N35532, AI581853, AA689457, AI520938, AA150058, AA507444, N26481, AW073092, AI863340, AA868027, AA909159, AA983159, AA829435, AI469742, AA136946, N35190, AA909264, AA587029, AA729752, AA886275, AA448553, F25329, AA917976, AW139387, F24032, D54530, AA152181, AI281705, N94436, AA723449, AA729741, F36770, N42432, AI609646, AI352654, AA872218, F18960, AW379804, AW204886, T78714,

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HTEPV02	205	1152263	1 - 1432	15 - 1446	AI204272, AI017771, AW297920, AA902816, and AA909581.
HTHBT91	206	954877	1 - 422	15 - 436	
HFVIH16	207	1164631	1 - 1582	15 - 1596	AW401441, T05017, M85838, AC003658, AC005620, AL008634, and AL133245.
HTJAB35	208	491273	1 - 507	15 - 521	AA504694, AW372019, AL133355, AC005484, AC007151, AC005527, AF053356, AL049872, AC005529, AC016026, U95742, AL049795, AC005295, U91321, AC007845, AC002365, AC002404, AC004675, AC006101, Z98051, Z98941, AC007842, AF088219, AC013256, AL096701, AC005664, AP000501, AC004895, AL031595, Z93023, and AC005102.
HRABP94	209	970481	1 - 1590	15 - 1604	AI952147, AA827782, AI523970, AW008938, AA236865, AI673370, AW043829, AI143323, N36986, AA306716, AI361743, AA460666, AW080829, AI914077, AI214786, AA862831, AI963652, AI913070, AI805253, AI423188, AI003936, AA994686, AA130868, AA533231, AI358965, AI873692, AA569719, AA865951, AA644481, AI272308, AI445569, AA130923, AI418685, AI669710, C00906, R85067, AA847433, AA502585, AA968581, AI088486, N46300, AA176755, AL048511, AA179075, AW163823, AW162071, AI274452, AL042488, AI799540, AI961393, AA904283, AI290128, F35031, AI582822, AA088789, AA829775, AI270039, AI679800, AW262565, AL042515, AI918424, AI884459, AA807326, AL122098, S68736, A57389, AL137562, AF158248, U72071, X79812, AL049959, AF070632, U92068, AJ131955, AF169154, AF030165, Z30970, AL096709, Z49258, AC006561, AL022396, AC007370, AL049540, U94316, AP000250, AP000133, AP000211, AF162270, I80845, AF107018, U77594, AL080074, AR029580, AL359711, AL359711, AL359711, AL109947, AL109947, AL109947, AL136222, and

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HWAGC08	210	958139	1 - 537	15 - 551	AA133438, AI904808, AA447236, AL048981, and AC005071.
HRDET35	211	945350	1 - 1798	15 - 1812	AA603325, AI123244, AI742610, AW451297, AW167511, AI869312, AA522674, AI122654, AI638539, AA693938, AI085752, AI922008, AI521658, AI913241, AI288451, AI432336, AI925715, AI394394, AI243319, AW301143, AI417213, AI056464, AA937953, AI827213, AI963292, AI094469, N94395, AA736786, AW444808, AA984628, H14735, AI425075, AA968590, AI445367, AI866676, AA627433, H25970, AI356146, AI742621, H27088, AI194056, AI803734, AI872656, AI420510, R69552, T73549, AI222629, H45935, Z38818, AI547263, H25733, Z42656, AI656165, H25937, AI557864, AI525500, AI541356, T18597, AI557262, D59436, AI557155, AI525316, AI541205, AI525556, AI541365, AI547250, AI557731, D59751, AA585098, AI535813, AI541321, AI557408, AI526078, R45895, AI546971, AA585325, D57491, C15737, AI557084, R29657, AI541346, AI541034, AA585101, AI557602, R28967, Z32887, AI535639, AI557317, R28735, R29445, Z32822, AI547196, AA585439, AI557808, AI546921, R28892, AI540974, AI547039, AI536138, AI535660, AI526140, D61185, Z28355, R28965, AA585155, AI541517, AI557740, T11028, R29218, AI547006, D60844, AI541027, AI557727, AA585476, AI546829, C16305, R28895, AI541535, AI526184, AI541506, AA283326, AI557238, AI546875, AA585329, AI525656, AI557763, D61254, AI546999, AI526113, AI557734, C16293, AI557082, Z30131, AI557787, AI557039, AI526194, D53472, D55233, D60765, AI525306, C16300, AA170832, AI541374, AI540903, AI557533, AI541383, C15069, AI546945, AI525431, AI541013, AI541523, Z33559, AI557809, AA585453, D53161, AI525856, AI541307, AJ239433, AI557807, R29177, AI546996, C15406, AI546891, AA359427, AA514191, C16296, AI557285, D54897, D57186, AI540967, C14208, AI557041, R29179, T41289, AI525320, AA883608, AI526186, AI526187, R29262, AI541056, AI541048, AI541075, R29172, AI557279, D53447, AI525339, C14391, C15120, C16315, C16292, AI547202, AA585378, AI556967, AI526016, C15762, AI547137, AI526195, AA585356, AI526180, AI526073, AI557718, AA174170, AA585434, AI541527, C16294, AI525653, D52835, AI557852, C14322, AI526191, D30843, AI557758, AI526146, AI546828, AI541415, AI557264, D59458, D60730, AI540944, AI557799, T41329, C14723, AI541422, AA585440, AI541514, AI525286,

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HGBIA24	212	1153890	1 - 1110	15 - 1124	AL042041, W40130, AW179228, AI807061, AB002377, U04847, AR036413, and Y17126.
HTTHF21	213	921596	1 - 798	15 - 812	AA699339, AC074092, AC074092, AC013264, and AC013264.
HWHJZ40	214	964153	1 - 1277	15 - 1291	N47207, AI971441, and AL122104.
HJMBN52	215	966226	1 - 1049	15 - 1063	AL079758, AI288028, AW135082, AI081066,

					AA806585, AA282088, AI799780, AI623497, AI918288, AL079951, AA535036, AI932410, Z41770, AI990083, H11909, AI561356, AI538692, AW025279, AW192300, AI679550, AI812015, AW084056, AI348901, AI309306, AI783792, AI560679, AA575874, AW080076, AW168451, AI677797, AI678409, AI537677, AI669639, AI690961, AW150762, AI433611, AI096771, AI251221, AL040694, AW162194, AW150326, AI370623, AI570966, AW004886, AI623835, AI922315, AI225000, AI927233, AI589428, AI242246, AI887163, AI491710, AI784387, AI866573, AI345415, AI419440, AI537991, AI819202, AA190918, AI434731, AI270183, AW059568, AI886123, AW081255, N25033, AI915295, AI934035, AI539800, AW190297, AW085786, AI886355, AI284060, AW148303, AW020693, AW148738, AI918408, AW075382, AW020381, AA835966, AL048351, AI648458, AI572021, AI537643, AI554484, AI826225, AI560545, AI524179, AL036265, AI680369, AW019985, AI636456, AL043091, AI554485, AW189126, AI919147, AI859464, AI537187, AA654165, AW051088, AW087877, W31910, AI630877, AW079572, AW168828, AI554402, AI933992, AW084447, AI758652, AI627714, AI114703, F35299, AW075936, AW089405, AW080746, AI889180, AI698391, AI040725, AL042191, F33257, AI886055, AI866040, AI567866, AI590043, AI923989, AI619820, AA464027, AI926593, AI859644, AI536685, AW152067, AL036638, AW195253, AI433206, AI280661, AA857847, AW051048, AI434242, AL046454, AI276358, AL046466, AI648699, AI590999, AI863665, AI961589, AI540606, AI537516, AI953803, AW071689, AW078710, AI336644, AI863241, AI224373, AW194185, AW118417, AI926041, AW118353, AI474646, AI669864, AI254727, AW082532, AI689614, AI683939, AI538342, AA493109, AL041220, AI699823, AI863455, AI888621, AI564448, AI365256, AI312428, AI873638, AI432644, AI249877, AW194014, AI917331, AI802240, AI352326, AI688854, AW088882, AI499279, AI571529, AW151283, AW168875, AI250627, AW128931, AA464646, AW239367, AW022084, W81248, AI625516, AL048871, AA760851, AW022636, AW191844, AI573167, AI245008, AI357599, AI282268, AI539771, AI554444, AI471429, AL046931, AI802654, AI537863, AW173633, AI633061, AI814087, AL041230, AW410177, AW022584, AA908294, AI446646, AI700159, AI862144, AI628325, AA748682, AL040241, AI678446, AI888317, F34698, AI434134, AW082623, AW029197, AL135047,
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HUFCN47	216	1197927	1 - 2596	15 - 2610	AI760194, AI927898, AI336201, AI927907, AA584317, AW295934, AI913591, AA779893, AI927508, AI651559, AI829397, W87653, AA776800, AA776850, AI761887, AA778340, AA137050, AA129545, AW268410, AW369793, AI291466, AW172272, AI033092, AI122659, AA825180, AA779164, AW150144, AI499117, W72249, AI478286, AW022740, N23572, AI811636, AA393829, AA595168, AA393828, AI689567, AI828403, AI151409, AA678034, AI650760, AI671401, AA122104, AI679454, AA934508, AI624260, AW140004, AI373049, H98850, AW168229, AA558970, AA452648, AI311851, AI623111, W87654, AI221442, W86674, W76334, AI368965, AI186444, AA136524, AA137122, AA429808, AA861331, H99223, AI138483, AA789253, N29659, AA931521, AA938437, N56614, R61734, AA644126, W86530, AI017369, W56880, H13339, AI023729, AA322817, AA370677, AI989760, AA416684, N68604, T71029, R66190, Z42947, AI985238, R59589, AA370676, AA301141, AI695321, W60230, F06078, AI273943, AI865027, AA724462, H22960, AI521700, T79145, F10189, AI537308, R61735, N26340, AA007246, T79226, AI363800, R67070, T99989, AA057869, AI391674, AI096493, AA905436, AA394311, AA122103, T35380, AI659488, AL047735, AI569343, H16201, AA249553, W25579, H16200, AA056994, T34602, AA972578, H85574, AA703249, AI718301, H84136, AI769144, AA446145, T19228, AI912488, H84137, AA007247, AW026302, AI150909, W60229, AA543012, AA805360, AI923763, AI808053, AI923755, AI038549, AI299392, AA525242, AI363317, AI423070, AW074268, AI004762, AI142528, AI366824, AW189200, AI809295, AI422905, AI581719, AA435552, AI049778, AI434072, AW340472, AA720972, AA285270, AI298865, R84798, AA682274, AA825825, AW074622, AI299364, R98981, AI653505, AI653497, AI005389, AW378651, AW378652, AA778203, H38182, AA594432, AI686562, Z20432, AA605010, AI903936, AW376259, H47520, AA937921, AI251939, T67636, AI368176, AA972687, AA563913, AA772536, and A74394.

HHEUC31	217	1091624	1 - 772	15 - 786	AA132827, and AI905590.
HUSAL47	218	1197928	1 - 2848	15 - 2862	AI160081, AI240596, AI804003, AA459487, AA742366, AA972891, AA280738, AA612844, AA578562, AW182249, AW449085, AA665027, N44566, D81704, AA748357, D60753, H58990, R66624, H78860, and AA195537.
HHFGD38	219	1153892	1 - 1115	15 - 1129	AI675967, AI972614, AA463221, AI022794, AI424263, AA001733, AL036043, AA463220, AA247152, AA670278, AA331577, AC010385, AF042089, and AL137717.
HVAOG11	220	1152275	1 - 1054	15 - 1068	N25812.
HUVDR03	221	974684	1 - 3242	15 - 3256	AA768846, AI671768, AI961239, AI884699, AA514474, AI521280, AA156958, AI679628, AI139530, AI885479, AI336225, AI735075, AI186828, AI626081, AI494518, AI275985, AA749446, AI914010, AI130746, AI921928, AA993271, AW207720, AI130728, AI299980, AA976621, W69667, AA742981, AA229014, AI279330, AA156866, R19745, AI216523, AA255782, AI811823, R84393, AA488821, AI419263, AA489068, AA229863, AA701250, AA705638, N47318, AA229731, AW271763, AA687125, AA862901, AW372345, AW272381, AA939081, AL044304, W73428, AI478491, AW089880, AA702739, AW021871, AA765337, AA977247, F06156, W73367, AI141957, W45513, AA127066, AI283582, R84392, AI985183, AW439593, AI560741, AI186368, AI687916, AI203537, AA047572, W69666, H66133, AI081094, AA453238, AA463404, AA356896, AW294792, AA318684, H66549, AL046248, AA373158, AA011074, AL046015, Z25224, AA480226, AW292636, H43300, AI222506, W24708, AA492470, AA579885, T47922, T47923, AA348753, T05906, AA455850, H43299, AW292633, AI419633, AA011075, D61430, AI587496, AA772416, AA147480, N92391, AA378964, R45164, AA714016, AA130104, AI560507, AW272813, AW376847, AI471022, H16172, AI568064, R68334, AI567645, AW376809, W45654, AA256004, AA280280, AL133683, AA378963, AA341472, AA887264, AA147880, AA704633, AA429202, AI905673, AI216605, AW168495, C14179, AI963999, AC020663, AF108453, U70255, L06564, X89268, and AF005380.
HUDAE29	222	689811	1 - 275	15 - 289	AI191415.
HIBCJ89	223	954681	1 - 2516	15 - 2530	AL039924, AA633985, W76256, W72063, W58499, AL045794, AL044364, AW013814, AA349955, AL036630, AA349954, AW450335, T02921, AL044412, W58534, T24112, T24119, AL039459, AL036650, AA778891, AL039476, AL042334, AL040992, AL039109, AL038531, AL037726, AL039629, AL039659, AL039625, AL039648, AL038837,

					AL039074, AL039566, AL039678, AL039108, AL039538, AL039564, AL039509, AL039156, H00069, AL042909, AL039128, AL044407, AL036973, AL045341, AL045337, AL037051, AL045353, AL039386, AL039423, AL039410, AL039150, AL038025, AL038821, AL044530, AL036725, AL039521, AL043445, AL043422, F25532, AI535983, F18362, AL043586, T23947, AL043423, AL044413, AL043441, AL036196, F34438, AL037639, AL037615, AW451070, AL036767, AL036117, AI535783, AL039085, AL043613, AL037526, AL043585, AL036238, R47228, AL036679, AW452756, AI655417, AW297822, AL037601, AL039576, AL044178, AL039504, AL036158, AL036733, AL039842, AL036964, AL037027, D51250, AL043840, AL039550, AL036924, AL036765, AL037054, T23659, AL040947, AL037177, AL038851, AL036998, T23658, AL037643, AL036133, AL036418, AL036227, AL036163, AL037047, AW293068, AL037082, D80253, AL036207, AL037124, AL036167, AL039472, AL036191, AL036132, AL037021, AL044354, AL037049, D59787, AL037600, AL036190, AL037679, AL036139, D59275, AL036152, D80043, D80219, T48598, AL036900, T23656, AL037178, AA514190, AL048425, AW451416, AL039555, D80227, AL037085, Z25782, AL036174, AL036953, D80240, AL036808, D80134, AL037569, D51423, Z99396, T11051, AL036150, D80210, AW450376, H00072, D59619, AL036268, AL038043, C14227, AL044447, D80193, AL037077, D80196, AI557751, AL037002, AL039417, D80168, Z25783, AW135155, D59927, D80366, AL036858, C75259, C14389, AL037016, AL036229, D59889, AL034408, A95051, A18050, AR007512, A18053, AR036905, AR062871, AR043601, A23334, A75888, I70384, A60111, A23633, AR017907, AR062872, A84775, AR062873, A84772, A84776, A84773, I06859, A84774, AR067731, AR067732, A91750, A20702, A58522, A43189, A43188, A20700, E12615, AR035193, A92133, I60241, I60242, AR027100, I28266, AR043602, AR043603, E13740, A98767, A25909, A23998, A95052, A93963, A93964, A38214, A10361, A95117, AR037157, A44171, I56772, I95540, AR018924, A63067, A51047, A63064, AR031374, AR018923, A48774, A63072, A49700, A48775, AR068507, AR068506, I63120, AR054109, AR015960, AR000007, AR015961, I03343, A58521, A86792,
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HIBEG40	224	504158	1 - 389	15 - 403	AA351313, and AA351814.
HWBEG33	225	1195806	1 - 2298	15 - 2312	AA195189, AI872284, AI970956, AA195225, AW081553, AI087990, AW450597, AI813529, AA196805, AW341108, AI989416, AA761908, AA192619, AA196388, AA907918, AI005370, AI125962, AA180234, AI692710, F33759, F30952, Z17874, AA180852, AA196665, AA490979, AA363184, F36186, AI681453, AA768364, AL137735, AF155353, AF159164, AL132642, AW510603, AW770570, and AW770858.
HWHKD22	226	1150878	1 - 791	15 - 805	AI829903, AI633646, AI986119, AI769747, AI984540, AW337994, AI769807, AI610118, AI354761, AW014492, AI696473, AI815233, AA205305, AA811626, AA418029, AA808125, N70046, AI825035, AI371756, AI680927, AI632886, H39858, AW302373, N25678, AI915190, AA810844, R86213, AA846497, AA442702, AI298620, AI916429, AI299340, H28050, AA633452, AA496038,

					and AA418089.
HSLFO41	227	765497	1 - 336	15 - 350	
HE9SE46	228	944511	1 - 2126	15 - 2140	AA195155, AI268255, AW419341, AI824127, AI797143, AI300923, AI292148, AI703401, AI268439, AI292153, AW137704, AI831208, R35403, AW137395, AI379414, AI379109, AI277432, AA057594, AI432198, AI300400, AI300976, AI300968, AW138254, AA862254, AA978306, AA136742, AA187853, AA411758, AW139302, AA418285, AI697655, AA136133, AI299234, W44727, AW135673, AA933000, AA195026, AW134622, AI336837, AI214619, AW388217, AA406572, AI342824, AW388179, AI222659, AI378218, AW370464, AA878171, AA825160, R25577, AI871540, AW388239, AA985538, AI468745, AW206391, T10355, AA424539, T75128, AA418322, R05548, AA976873, AA363106, F11165, H09479, AA114288, F12796, AA346579, AA112328, AA917973, Z42588, R18424, AA424606, AA781256, AA625611, AI633662, AA331566, N90086, AA055551, C18803, AI695403, AI741622, AW378385, AA995638, N63577, F05973, AA455944, AA190723, AA904239, AA436288, AI752009, and AI305270.
HTLDW37	229	864276	1 - 1104	15 - 1118	AW025605, AW025604, AA862436, AA375852, AI732328, AA371876, AI033275, and AB014607.
HWAFG54	230	1227138	1 - 3744	15 - 3758	AI760827, AW408019, AI253155, AI349366, AI356482, AA814034, AW075920, AW407984, AI760691, AA251937, AI766650, AA352825, AA243541, AI934100, AA352840, H72208, H72106, AW193021, AL035530, and AW664438.
HKAFS73	231	810433	1 - 396	15 - 410	N80779.
HTXJD74	232	921175	1 - 1097	15 - 1111	AA030013, W04200, T96295, AA348729, AW369326, AI817745, AI902506, AI740457, AA303510, AI902496, AW298344, AA843339, AI902495, AI902509, W19941, AW452907, AI902510, AI610042, AF151638, AF114430, U21660, Z50026, AF151639, AF040261, AF114436, Z50024, AF114437, AF114431, AF114434, AF114432, AF114433, AF114435, and AF040266.
HSIGQ50	233	932448	1 - 1332	15 - 1346	AW361379, AA131062, AC015551, AC019214, and AC019214.
HWWDY4 5	234	932607	1 - 713	15 - 727	AA451973, AW044300, AI925874, AC002064, and AC006153.
HNSMB24	235	971537	1 - 671	15 - 685	AI978874, AI469095, AP001623, AP001623, AC015555, and AC015555.
HWLOU63	236	946862	1 - 709	15 - 723	AI074147, AI249752, AA573289, AI744674, AW081142, AI951269, AI560208, AI309528, AI097133, AI310351, AI222028, AW073286, AA121301, AI160271, AI991117, AW170797, AA278853, H47623, AA742972, AA864447, AI572193, AA173309, AW188877, H69345,

					AA121349, AW363751, AW383987, AW372736, AI476011, AW372731, AW372739, AW372742, AW372744, N22901, AA769896, AW372786, AW372740, AW388634, AW372738, AW372734, AW372745, AW372735, AW372737, H69344, and AF132937.
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TABLE 4

Code	Description	Tissue	Organ	Cell Line	Disease	Vector
AR022	a_Heart	a_Heart				
AR023	a_Liver	a_Liver				
AR024	a_mammary gland	a_mammary gland				
AR025	a_Prostate	a_Prostate				
AR026	a_small intestine	a_small intestine				
AR027	a_Stomach	a_Stomach				
AR028	Blood B cells	Blood B cells				
AR029	Blood B cells activated	Blood B cells activated				
AR030	Blood B cells resting	Blood B cells resting				
AR031	Blood T cells activated	Blood T cells activated				
AR032	Blood T cells resting	Blood T cells resting				
AR033	brain	brain				
AR034	breast	breast				
AR035	breast cancer	breast cancer				
AR036	Cell Line CAOV3	Cell Line CAOV3				
AR037	cell line PA-1	cell line PA-1				
AR038	cell line transformed	cell line transformed				
AR039	colon	colon				
AR040	colon (9808co65R)	colon (9808co65R)				
AR041	colon (9809co15)	colon (9809co15)				
AR042	colon cancer	colon cancer				
AR043	colon cancer (9808co64R)	colon cancer (9808co64R)				
AR044	colon cancer 9809co14	colon cancer 9809co14				
AR045	corn clone 5	corn clone 5				
AR046	corn clone 6	corn clone 6				
AR047	corn clone2	corn clone2				
AR048	corn clone3	corn clone3				
AR049	Corn Clone4	Corn Clone4				
AR050	Donor II B Cells 24hrs	Donor II B Cells 24hrs				
AR051	Donor II B Cells 72hrs	Donor II B Cells 72hrs				
AR052	Donor II B-Cells 24 hrs.	Donor II B-Cells 24 hrs.				
AR053	Donor II B-Cells 72hrs	Donor II B-Cells 72hrs				
AR054	Donor II Resting B Cells	Donor II Resting B Cells				
AR055	Heart	Heart				
AR056	Human Lung (clonotech)	Human Lung (clonotech)				
AR057	Human Mammary (clontech)	Human Mammary (clontech)				

AR058	Human Thymus (clonotech)	Human Thymus (clonotech)				
AR059	Jurkat (unstimulated)	Jurkat (unstimulated)				
AR060	Kidney	Kidney				
AR061	Liver	Liver				
AR062	Liver (Clontech)	Liver (Clontech)				
AR063	Lymphocytes chronic lymphocytic leukaemia	Lymphocytes chronic lymphocytic leukaemia				
AR064	Lymphocytes diffuse large B cell lymphoma	Lymphocytes diffuse large B cell lymphoma				
AR065	Lymphocytes follicular lymphoma	Lymphocytes follicular lymphoma				
AR066	normal breast	normal breast				
AR067	Normal Ovarian (4004901)	Normal Ovarian (4004901)				
AR068	Normal Ovary 9508G045	Normal Ovary 9508G045				
AR069	Normal Ovary 9701G208	Normal Ovary 9701G208				
AR070	Normal Ovary 9806G005	Normal Ovary 9806G005				
AR071	Ovarian Cancer	Ovarian Cancer				
AR072	Ovarian Cancer (9702G001)	Ovarian Cancer (9702G001)				
AR073	Ovarian Cancer (9707G029)	Ovarian Cancer (9707G029)				
AR074	Ovarian Cancer (9804G011)	Ovarian Cancer (9804G011)				
AR075	Ovarian Cancer (9806G019)	Ovarian Cancer (9806G019)				
AR076	Ovarian Cancer (9807G017)	Ovarian Cancer (9807G017)				
AR077	Ovarian Cancer (9809G001)	Ovarian Cancer (9809G001)				
AR078	ovarian cancer 15799	ovarian cancer 15799				
AR079	Ovarian Cancer 17717AID	Ovarian Cancer 17717AID				
AR080	Ovarian Cancer 4004664B1	Ovarian Cancer 4004664B1				
AR081	Ovarian Cancer 4005315A1	Ovarian Cancer 4005315A1				
AR082	ovarian cancer 94127303	ovarian cancer 94127303				
AR083	Ovarian Cancer 96069304	Ovarian Cancer 96069304				
AR084	Ovarian Cancer 9707G029	Ovarian Cancer 9707G029				
AR085	Ovarian Cancer 9807G045	Ovarian Cancer 9807G045				

AR086	ovarian cancer 9809G001	ovarian cancer 9809G001				
AR087	Ovarian Cancer 9905C032RC	Ovarian Cancer 9905C032RC				
AR088	Ovarian cancer 9907 C00 3rd	Ovarian cancer 9907 C00 3rd				
AR089	Prostate	Prostate				
AR090	Prostate (clonotech)	Prostate (clonotech)				
AR091	prostate cancer	prostate cancer				
AR092	prostate cancer #15176	prostate cancer #15176				
AR093	prostate cancer #15509	prostate cancer #15509				
AR094	prostate cancer #15673	prostate cancer #15673				
AR095	Small Intestine (Clontech)	Small Intestine (Clontech)				
AR096	Spleen	Spleen				
AR097	Thymus T cells activated	Thymus T cells activated				
AR098	Thymus T cells resting	Thymus T cells resting				
AR099	Tonsil	Tonsil				
AR100	Tonsil germinal center centroblast	Tonsil germinal center centroblast				
AR101	Tonsil germinal center B cell	Tonsil germinal center B cell				
AR102	Tonsil lymph node	Tonsil lymph node				
AR103	Tonsil memory B cell	Tonsil memory B cell				
AR104	Whole Brain	Whole Brain				
AR105	Xenograft ES-2	Xenograft ES-2				
AR106	Xenograft SW626	Xenograft SW626				
H0002	Human Adult Heart	Human Adult Heart	Heart			Uni-ZAP XR
H0004	Human Adult Spleen	Human Adult Spleen	Spleen			Uni-ZAP XR
H0007	Human Cerebellum	Human Cerebellum	Brain			Uni-ZAP XR
H0008	Whole 6 Week Old Embryo					Uni-ZAP XR
H0009	Human Fetal Brain					Uni-ZAP XR
H0012	Human Fetal Kidney	Human Fetal Kidney	Kidney			Uni-ZAP XR
H0013	Human 8 Week Whole Embryo	Human 8 Week Old Embryo	Embryo			Uni-ZAP XR
H0014	Human Gall Bladder	Human Gall Bladder	Gall Bladder			Uni-ZAP XR
H0015	Human Gall Bladder, fraction II	Human Gall Bladder	Gall Bladder			Uni-ZAP XR
H0016	Human Greater Omentum	Human Greater Omentum	peritoneum			Uni-ZAP XR
H0018	Human Greater Omentum, fII remake	Human Greater Omentum	peritoneum			Uni-ZAP XR
H0023	Human Fetal Lung					Uni-ZAP XR
H0024	Human Fetal Lung III	Human Fetal Lung	Lung			Uni-ZAP XR

H0026	Namalwa Cells	Namalwa B-Cell Line, EBV immortalized				Lambda ZAP II
H0028	Human Old Ovary	Human Old Ovary	Ovary			pBluescript
H0030	Human Placenta					Uni-ZAP XR
H0031	Human Placenta	Human Placenta	Placenta			Uni-ZAP XR
H0032	Human Prostate	Human Prostate	Prostate			Uni-ZAP XR
H0033	Human Pituitary	Human Pituitary				Uni-ZAP XR
H0036	Human Adult Small Intestine	Human Adult Small Intestine	Small Int.			Uni-ZAP XR
H0037	Human Adult Small Intestine	Human Adult Small Intestine	Small Int.			pBluescript
H0038	Human Testes	Human Testes	Testis			Uni-ZAP XR
H0039	Human Pancreas Tumor	Human Pancreas Tumor	Pancreas		disease	Uni-ZAP XR
H0040	Human Testes Tumor	Human Testes Tumor	Testis		disease	Uni-ZAP XR
H0041	Human Fetal Bone	Human Fetal Bone	Bone			Uni-ZAP XR
H0042	Human Adult Pulmonary	Human Adult Pulmonary	Lung			Uni-ZAP XR
H0046	Human Endometrial Tumor	Human Endometrial Tumor	Uterus		disease	Uni-ZAP XR
H0047	Human Fetal Liver	Human Fetal Liver	Liver			Uni-ZAP XR
H0048	Human Pineal Gland	Human Pineal Gland				Uni-ZAP XR
H0050	Human Fetal Heart	Human Fetal Heart	Heart			Uni-ZAP XR
H0051	Human Hippocampus	Human Hippocampus	Brain			Uni-ZAP XR
H0052	Human Cerebellum	Human Cerebellum	Brain			Uni-ZAP XR
H0056	Human Umbilical Vein, Endo. remake	Human Umbilical Vein Endothelial Cells	Umbilical vein			Uni-ZAP XR
H0057	Human Fetal Spleen					Uni-ZAP XR
H0058	Human Thymus Tumor	Human Thymus Tumor	Thymus		disease	Lambda ZAP II
H0059	Human Uterine Cancer	Human Uterine Cancer	Uterus		disease	Lambda ZAP II
H0063	Human Thymus	Human Thymus	Thymus			Uni-ZAP XR
H0064	Human Right Hemisphere of Brain	Human Brain, right hemisphere	Brain			Uni-ZAP XR
H0068	Human Skin Tumor	Human Skin Tumor	Skin		disease	Uni-ZAP XR
H0069	Human Activated T-Cells	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0070	Human Pancreas	Human Pancreas	Pancreas			Uni-ZAP XR
H0071	Human Infant Adrenal Gland	Human Infant Adrenal Gland	Adrenal gland			Uni-ZAP XR
H0075	Human Activated T-Cells (II)	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0079	Human Whole 7 Week Old Embryo (II)	Human Whole 7 Week Old Embryo	Embryo			Uni-ZAP XR
H0081	Human Fetal Epithelium (Skin)	Human Fetal Skin	Skin			Uni-ZAP XR
H0083	HUMAN JURKAT MEMBRANE BOUND	Jurkat Cells				Uni-ZAP XR

	POLYSOMES					
H0085	Human Colon	Human Colon				Lambda ZAP II
H0086	Human epithelioid sarcoma	Epithelioid Sarcoma, muscle	Sk Muscle		disease	Uni-ZAP XR
H0087	Human Thymus	Human Thymus				pBluescript
H0090	Human T-Cell Lymphoma	T-Cell Lymphoma	T-Cell		disease	Uni-ZAP XR
H0097	Human Adult Heart, subtracted	Human Adult Heart	Heart			pBluescript
H0098	Human Adult Liver, subtracted	Human Adult Liver	Liver			Uni-ZAP XR
H0099	Human Lung Cancer, subtracted	Human Lung Cancer	Lung			pBluescript
H0100	Human Whole Six Week Old Embryo	Human Whole Six Week Old Embryo	Embryo			Uni-ZAP XR
H0101	Human 7 Weeks Old Embryo, subtracted	Human Whole 7 Week Old Embryo	Embryo			Lambda ZAP II
H0102	Human Whole 6 Week Old Embryo (II), subt	Human Whole Six Week Old Embryo	Embryo			pBluescript
H0103	Human Fetal Brain, subtracted	Human Fetal Brain	Brain			Uni-ZAP XR
H0109	Human Macrophage, subtracted	Macrophage	Blood	Cell Line		pBluescript
H0111	Human Placenta, subtracted	Human Placenta	Placenta			pBluescript
H0116	Human Thymus Tumor, subtracted	Human Thymus Tumor	Thymus			pBluescript
H0119	Human Pediatric Kidney	Human Pediatric Kidney	Kidney			Uni-ZAP XR
H0122	Human Adult Skeletal Muscle	Human Skeletal Muscle	Sk Muscle			Uni-ZAP XR
H0123	Human Fetal Dura Mater	Human Fetal Dura Mater	Brain			Uni-ZAP XR
H0124	Human Rhabdomyosarcoma	Human Rhabdomyosarcoma	Sk Muscle		disease	Uni-ZAP XR
H0125	Cem cells cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		Uni-ZAP XR
H0130	LNCAP untreated	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
H0134	Raji Cells, cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		Uni-ZAP XR
H0135	Human Synovial Sarcoma	Human Synovial Sarcoma	Synovium			Uni-ZAP XR
H0136	Supt Cells, cyclohexamide treated	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		Uni-ZAP XR
H0141	Activated T-Cells, 12 hrs.	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0144	Nine Week Old Early Stage Human	9 Wk Old Early Stage Human	Embryo			Uni-ZAP XR
H0149	7 Week Old Early Stage Human, subtracted	Human Whole 7 Week Old Embryo	Embryo			Uni-ZAP XR
H0150	Human Epididymus	Epididymis	Testis			Uni-ZAP XR
H0151	Early Stage Human Liver	Human Fetal Liver	Liver			Uni-ZAP XR

H0152	Early Stage Human Liver, fract (II)	Human Fetal Liver	Liver			Uni-ZAP XR
H0155	Human Thymus, subtracted	Human Thymus Tumor	Thymus			pBluescript
H0156	Human Adrenal Gland Tumor	Human Adrenal Gland Tumor	Adrenal Gland		disease	Uni-ZAP XR
H0161	Activated T-Cells, 24 hrs., ligation 2	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0163	Human Synovium	Human Synovium	Synovium			Uni-ZAP XR
H0164	Human Trachea Tumor	Human Trachea Tumor	Trachea		disease	Uni-ZAP XR
H0165	Human Prostate Cancer, Stage B2	Human Prostate Cancer, stage B2	Prostate		disease	Uni-ZAP XR
H0166	Human Prostate Cancer, Stage B2 fraction	Human Prostate Cancer, stage B2	Prostate		disease	Uni-ZAP XR
H0169	Human Prostate Cancer, Stage C fraction	Human Prostate Cancer, stage C	Prostate		disease	Uni-ZAP XR
H0170	12 Week Old Early Stage Human	Twelve Week Old Early Stage Human	Embryo			Uni-ZAP XR
H0171	12 Week Old Early Stage Human, II	Twelve Week Old Early Stage Human	Embryo			Uni-ZAP XR
H0173	Human Cardiomyopathy, RNA remake	Human Cardiomyopathy	Heart		disease	Uni-ZAP XR
H0178	Human Fetal Brain	Human Fetal Brain	Brain			Uni-ZAP XR
H0179	Human Neutrophil	Human Neutrophil	Blood	Cell Line		Uni-ZAP XR
H0181	Human Primary Breast Cancer	Human Primary Breast Cancer	Breast		disease	Uni-ZAP XR
H0187	Resting T-Cell	T-Cells	Blood	Cell Line		Lambda ZAP II
H0188	Human Normal Breast	Human Normal Breast	Breast			Uni-ZAP XR
H0194	Human Cerebellum, subtracted	Human Cerebellum	Brain			pBluescript
H0196	Human Cardiomyopathy, subtracted	Human Cardiomyopathy	Heart			Uni-ZAP XR
H0197	Human Fetal Liver, subtracted	Human Fetal Liver	Liver			Uni-ZAP XR
H0198	Human Fetal Liver, subtracted, pos. clon	Human Fetal Liver	Liver			Uni-ZAP XR
H0199	Human Fetal Liver, subtracted, neg clone	Human Fetal Liver	Liver			Uni-ZAP XR
H0200	Human Greater Omentum, fract II remake,	Human Greater Omentum	peritoneum			Uni-ZAP XR
H0204	Human Colon Cancer, subtracted	Human Colon Cancer	Colon			pBluescript
H0207	LNCAP, differential expression	LNCAP Cell Line	Prostate	Cell Line		pBluescript
H0208	Early Stage Human Lung, subtracted	Human Fetal Lung	Lung			pBluescript
H0212	Human Prostate, subtracted	Human Prostate	Prostate			pBluescript
H0213	Human Pituitary, subtracted	Human Pituitary				Uni-ZAP XR
H0214	Raji cells, cyclohexamide	Cyclohexamide	Blood	Cell Line		pBluescript

	treated, subtracted	Treated Cem, Jurkat, Raji, and Supt				
H0216	Supt cells, cyclohexamide treated, subtracted	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0217	Supt cells, cyclohexamide treated, differentially expressed	Cyclohexamide Treated Cem, Jurkat, Raji, and Supt	Blood	Cell Line		pBluescript
H0225	Activated T-Cells, 12hrs, differentially expressed	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0228	C7MCF7 cell line, estrogen treated	C7MCF7 Cell Line, estrogen treated	Breast	Cell Line		Uni-ZAP XR
H0230	Human Cardiomyopathy, diff exp	Human Cardiomyopathy	Heart		disease	Uni-ZAP XR
H0231	Human Colon, subtraction	Human Colon				pBluescript
H0235	Human colon cancer, metatized to liver, subtraction	Human Colon Cancer, metastized to liver	Liver			pBluescript
H0239	Human Kidney Tumor	Human Kidney Tumor	Kidney		disease	Uni-ZAP XR
H0242	Human Fetal Heart, Differential (Fetal-Specific)	Human Fetal Heart	Heart			pBluescript
H0244	Human 8 Week Whole Embryo, subtracted	Human 8 Week Old Embryo	Embryo			Uni-ZAP XR
H0246	Human Fetal Liver-Enzyme subtraction	Human Fetal Liver	Liver			Uni-ZAP XR
H0247	Human Membrane Bound Polysomes- Enzyme Subtraction	Human Membrane Bound Polysomes	Blood	Cell Line		Uni-ZAP XR
H0249	HE7, subtracted by hybridization with E7 cDNA	Human Whole 7 Week Old Embryo	Embryo			Uni-ZAP XR
H0250	Human Activated Monocytes	Human Monocytes				Uni-ZAP XR
H0251	Human Chondrosarcoma	Human Chondrosarcoma	Cartilage		disease	Uni-ZAP XR
H0252	Human Osteosarcoma	Human Osteosarcoma	Bone		disease	Uni-ZAP XR
H0253	Human adult testis, large inserts	Human Adult Testis	Testis			Uni-ZAP XR
H0254	Breast Lymph node cDNA library	Breast Lymph Node	Lymph Node			Uni-ZAP XR
H0255	breast lymph node CDNA library	Breast Lymph Node	Lymph Node			Lambda ZAP II
H0261	H. cerebellum, Enzyme subtracted	Human Cerebellum	Brain			Uni-ZAP XR
H0263	human colon cancer	Human Colon Cancer	Colon		disease	Lambda ZAP II
H0264	human tonsils	Human Tonsil	Tonsil			Uni-ZAP XR
H0265	Activated T-Cell (12hs)/Thiouridine labelledEco	T-Cells	Blood	Cell Line		Uni-ZAP XR

H0266	Human Microvascular Endothelial Cells, fract. A	HMEC	Vein	Cell Line		Lambda ZAP II
H0267	Human Microvascular Endothelial Cells, fract. B	HMEC	Vein	Cell Line		Lambda ZAP II
H0268	Human Umbilical Vein Endothelial Cells, fract. A	HUVE Cells	Umbilical vein	Cell Line		Lambda ZAP II
H0270	HPAS (human pancreas, subtracted)	Human Pancreas	Pancreas			Uni-ZAP XR
H0271	Human Neutrophil, Activated	Human Neutrophil - Activated	Blood	Cell Line		Uni-ZAP XR
H0272	HUMAN TONSILS, FRACTION 2	Human Tonsil	Tonsil			Uni-ZAP XR
H0282	HBGB's differential consolidation	Human Primary Breast Cancer	Breast			Uni-ZAP XR
H0286	Human OB MG63 treated (10 nM E2) fraction I	Human Osteoblastoma MG63 cell line	Bone	Cell Line		Uni-ZAP XR
H0288	Human OB HOS control fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0290	Human OB HOS treated (1 nM E2) fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0292	Human OB HOS treated (10 nM E2) fraction I	Human Osteoblastoma HOS cell line	Bone	Cell Line		Uni-ZAP XR
H0294	Amniotic Cells - TNF induced	Amniotic Cells - TNF induced	Placenta	Cell Line		Uni-ZAP XR
H0295	Amniotic Cells - Primary Culture	Amniotic Cells - Primary Culture	Placenta	Cell Line		Uni-ZAP XR
H0298	HCBB's differential consolidation	CAMA1Ee Cell Line	Breast	Cell Line		Uni-ZAP XR
H0305	CD34 positive cells (Cord Blood)	CD34 Positive Cells	Cord Blood			ZAP Express
H0306	CD34 depleted Buffy Coat (Cord Blood)	CD34 Depleted Buffy Coat (Cord Blood)	Cord Blood			ZAP Express
H0309	Human Chronic Synovitis	Synovium, Chronic Synovitis/ Osteoarthritis	Synovium		disease	Uni-ZAP XR
H0316	HUMAN STOMACH	Human Stomach	Stomach			Uni-ZAP XR
H0318	HUMAN B CELL LYMPHOMA	Human B Cell Lymphoma	Lymph Node		disease	Uni-ZAP XR
H0320	Human frontal cortex	Human Frontal Cortex	Brain			Uni-ZAP XR
H0321	HUMAN SCHWANOMA	Schwanoma	Nerve		disease	Uni-ZAP XR
H0327	human corpus colosum	Human Corpus Callosum	Brain			Uni-ZAP XR
H0328	human ovarian cancer	Ovarian Cancer	Ovary		disease	Uni-ZAP XR
H0329	Dermatofibrosarcoma Protuberance	Dermatofibrosarcoma Protuberans	Skin		disease	Uni-ZAP XR
H0331	Hepatocellular Tumor	Hepatocellular Tumor	Liver		disease	Lambda ZAP II

H0333	Hemangiopericytoma	Hemangiopericytoma	Blood vessel		disease	Lambda ZAP II
H0334	Kidney cancer	Kidney Cancer	Kidney		disease	Uni-ZAP XR
H0340	Corpus Callosum	Corpus Collosum-93052				Uni-ZAP XR
H0341	Bone Marrow Cell Line (RS4;11)	Bone Marrow Cell Line RS4;11	Bone Marrow	Cell Line		Uni-ZAP XR
H0343	stomach cancer (human)	Stomach Cancer - 5383A (human)			disease	Uni-ZAP XR
H0346	Brain-medulloblastoma	Brain (Medulloblastoma)-9405C006R	Brain		disease	Uni-ZAP XR
H0349	human adult liver cDNA library	Human Adult Liver	Liver			pCMVSPORT 1
H0350	Human Fetal Liver, mixed 10 & 14 week	Human Fetal Liver, mixed 10&14 Week	Liver			Uni-ZAP XR
H0351	Glioblastoma	Glioblastoma	Brain		disease	Uni-ZAP XR
H0352	wilm's tumor	Wilm's Tumor			disease	Uni-ZAP XR
H0354	Human Leukocytes	Human Leukocytes	Blood	Cell Line		pCMVSPORT 1
H0355	Human Liver	Human Liver, normal Adult				pCMVSPORT 1
H0356	Human Kidney	Human Kidney	Kidney			pCMVSPORT 1
H0357	H. Normalized Fetal Liver, II	Human Fetal Liver	Liver			Uni-ZAP XR
H0361	Human rejected kidney	Human Rejected Kidney			disease	pBluescript
H0365	Osteoclastoma-normalized B	Human Osteoclastoma			disease	Uni-ZAP XR
H0369	H. Atrophic Endometrium	Atrophic Endometrium and myometrium				Uni-ZAP XR
H0370	H. Lymph node breast Cancer	Lymph node with Met. Breast Cancer			disease	Uni-ZAP XR
H0373	Human Heart	Human Adult Heart	Heart			pCMVSPORT 1
H0375	Human Lung	Human Lung				pCMVSPORT 1
H0379	Human Tongue, frac 1	Human Tongue				pSport1
H0380	Human Tongue, frac 2	Human Tongue				pSport1
H0383	Human Prostate BPH, re-excision	Human Prostate BPH				Uni-ZAP XR
H0392	H. Meningioma, M1	Human Meningioma	brain			pSport1
H0393	Fetal Liver, subtraction II	Human Fetal Liver	Liver			pBluescript
H0396	L1 Cell line	Redd-Sternberg cell				ZAP Express
H0399	Human Kidney Cortex, re-rescue	Human Kidney Cortex				Lambda ZAP II
H0400	Human Striatum Depression, re-rescue	Human Brain, Striatum Depression	Brain			Lambda ZAP II
H0402	CD34 depleted Buffy Coat (Cord Blood), re-excision	CD34 Depleted Buffy Coat (Cord Blood)	Cord Blood			ZAP Express
H0405	Human Pituitary, subtracted VI	Human Pituitary				pBluescript
H0408	Human kidney Cortex, subtracted	Human Kidney Cortex				pBluescript

H0409	H. Striatum Depression, subtracted	Human Brain, Striatum Depression	Brain			pBluescript
H0411	H Female Bladder, Adult	Human Female Adult Bladder	Bladder			pSport1
H0412	Human umbilical vein endothelial cells, IL-4 induced	HUVE Cells	Umbilical vein	Cell Line		pSport1
H0413	Human Umbilical Vein Endothelial Cells, uninduced	HUVE Cells	Umbilical vein	Cell Line		pSport1
H0415	H. Ovarian Tumor, II, OV5232	Ovarian Tumor, OV5232	Ovary		disease	pCMVSPORT 2.0
H0416	Human Neutrophils, Activated, re-excision	Human Neutrophil - Activated	Blood	Cell Line		pBluescript
H0419	Bone Cancer, re-excision	Bone Cancer				Uni-ZAP XR
H0421	Human Bone Marrow, re-excision	Bone Marrow				pBluescript
H0422	T-Cell PHA 16 hrs	T-Cells	Blood	Cell Line		pSport1
H0423	T-Cell PHA 24 hrs	T-Cells	Blood	Cell Line		pSport1
H0424	Human Pituitary, subt IX	Human Pituitary				pBluescript
H0427	Human Adipose	Human Adipose, left hiplipoma				pSport1
H0428	Human Ovary	Human Ovary Tumor	Ovary			pSport1
H0431	H. Kidney Medulla, re-excision	Kidney medulla	Kidney			pBluescript
H0433	Human Umbilical Vein Endothelial cells, frac B, re-excision	HUVE Cells	Umbilical vein	Cell Line		pBluescript
H0434	Human Brain, striatum, re-excision	Human Brain, Striatum				pBluescript
H0435	Ovarian Tumor 10-3-95	Ovarian Tumor, OV350721	Ovary			pCMVSPORT 2.0
H0436	Resting T-Cell Library,II	T-Cells	Blood	Cell Line		pSport1
H0437	H Umbilical Vein Endothelial Cells, frac A, re-excision	HUVE Cells	Umbilical vein	Cell Line		Lambda ZAP II
H0438	H. Whole Brain #2, re-excision	Human Whole Brain #2				ZAP Express
H0441	H. Kidney Cortex, subtracted	Kidney cortex	Kidney			pBluescript
H0444	Spleen metastatic melanoma	Spleen, Metastatic malignant melanoma	Spleen		disease	pSport1
H0445	Spleen, Chronic lymphocytic leukemia	Human Spleen, CLL	Spleen		disease	pSport1
H0455	H. Striatum Depression, subt	Human Brain, Striatum Depression	Brain			pBluescript
H0457	Human Eosinophils	Human Eosinophils				pSport1
H0459	CD34+cells, II, FRACTION 2	CD34 positive cells				pCMVSPORT 2.0
H0478	Salivary Gland, Lib 2	Human Salivary Gland	Salivary gland			pSport1

H0483	Breast Cancer cell line, MDA 36	Breast Cancer Cell line, MDA 36				pSport1
H0484	Breast Cancer Cell line, angiogenic	Breast Cancer Cell line, Angiogenic, 36T3				pSport1
H0485	Hodgkin's Lymphoma I	Hodgkin's Lymphoma I			disease	pCMVSPORT 2.0
H0486	Hodgkin's Lymphoma II	Hodgkin's Lymphoma II			disease	pCMVSPORT 2.0
H0487	Human Tonsils, lib I	Human Tonsils				pCMVSPORT 2.0
H0488	Human Tonsils, Lib 2	Human Tonsils				pCMVSPORT 2.0
H0489	Crohn's Disease	Ileum	Intestine		disease	pSport1
H0492	HL-60, RA 4h, Subtracted	HL-60 Cells, RA stimulated for 4H	Blood	Cell Line		Uni-ZAP XR
H0494	Keratinocyte	Keratinocyte				pCMVSPORT 2.0
H0497	HEL cell line	HEL cell line		HEL 92.1.7		pSport1
H0506	Ulcerative Colitis	Colon	Colon			pSport1
H0509	Liver, Hepatoma	Human Liver, Hepatoma, patient 8	Liver		disease	pCMVSPORT 3.0
H0510	Human Liver, normal	Human Liver, normal, Patient # 8	Liver			pCMVSPORT 3.0
H0518	pBMC stimulated w/ poly I/C	pBMC stimulated with poly I/C				pCMVSPORT 3.0
H0519	NTERA2, control	NTERA2, Teratocarcinoma cell line				pCMVSPORT 3.0
H0520	NTERA2 + retinoic acid, 14 days	NTERA2, Teratocarcinoma cell line				pSport1
H0521	Primary Dendritic Cells, lib 1	Primary Dendritic cells				pCMVSPORT 3.0
H0522	Primary Dendritic cells, frac 2	Primary Dendritic cells				pCMVSPORT 3.0
H0525	PCR, pBMC I/C treated	pBMC stimulated with poly I/C				PCR II
H0527	Human Liver, normal, CapFinder	Human Liver, normal, Patient # 8	Liver			pSport1
H0529	Myeloid Progenitor Cell Line	TF-1 Cell Line; Myeloid progenitor cell line				pCMVSPORT 3.0
H0530	Human Dermal Endothelial Cells, untreated	Human Dermal Endothelial Cells; untreated				pSport1
H0538	Merkel Cells	Merkel cells	Lymph node			pSport1
H0539	Pancreas Islet Cell Tumor	Pancreas Islet Cell Tumour	Pancreas		disease	pSport1
H0542	T Cell helper I	Helper T cell				pCMVSPORT 3.0
H0543	T cell helper II	Helper T cell				pCMVSPORT 3.0
H0544	Human endometrial stromal cells	Human endometrial stromal cells				pCMVSPORT 3.0
H0545	Human endometrial stromal cells-treated with	Human endometrial stromal cells-treated				pCMVSPORT 3.0

	progesterone	with proge				
H0546	Human endometrial stromal cells-treated with estradiol	Human endometrial stromal cells-treated with estra				pCMVSPORT 3.0
H0547	NTERA2 teratocarcinoma cell line+retinoic acid (14 days)	NTERA2, Teratocarcinoma cell line				pSport1
H0549	H. Epididymus, caput & corpus	Human Epididymus, caput and corpus				Uni-ZAP XR
H0550	H. Epididymus, cauda	Human Epididymus, cauda				Uni-ZAP XR
H0551	Human Thymus Stromal Cells	Human Thymus Stromal Cells				pCMVSPORT 3.0
H0553	Human Placenta	Human Placenta				pCMVSPORT 3.0
H0555	Rejected Kidney, lib 4	Human Rejected Kidney	Kidney		disease	pCMVSPORT 3.0
H0556	Activated T-cell(12h)/Thiouridine-re-excision	T-Cells	Blood	Cell Line		Uni-ZAP XR
H0559	HL-60, PMA 4H, re-excision	HL-60 Cells, PMA stimulated 4H	Blood	Cell Line		Uni-ZAP XR
H0560	KMH2	KMH2				pCMVSPORT 3.0
H0561	L428	L428				pCMVSPORT 3.0
H0562	Human Fetal Brain, normalized c5-11-26	Human Fetal Brain				pCMVSPORT 2.0
H0563	Human Fetal Brain, normalized 50021F	Human Fetal Brain				pCMVSPORT 2.0
H0570	Human Fetal Brain, normalized C500H	Human Fetal Brain				pCMVSPORT 2.0
H0572	Human Fetal Brain, normalized AC5002	Human Fetal Brain				pCMVSPORT 2.0
H0574	Hepatocellular Tumor; re-excision	Hepatocellular Tumor	Liver		disease	Lambda ZAP II
H0575	Human Adult Pulmonary;re-excision	Human Adult Pulmonary	Lung			Uni-ZAP XR
H0576	Resting T-Cell; re-excision	T-Cells	Blood	Cell Line		Lambda ZAP II
H0579	Pericardium	Pericardium	Heart			pSport1
H0580	Dendritic cells, pooled	Pooled dendritic cells				pCMVSPORT 3.0
H0581	Human Bone Marrow, treated	Human Bone Marrow	Bone Marrow			pCMVSPORT 3.0
H0583	B Cell lymphoma	B Cell Lymphoma	B Cell		disease	pCMVSPORT 3.0
H0584	Activated T-cells, 24 hrs,re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0585	Activated T-Cells,12 hrs,re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0586	Healing groin wound, 6.5 hours post incision	healing groin wound, 6.5 hours post incision - 2/	groin		disease	pCMVSPORT 3.0
H0587	Healing groin wound; 7.5 hours post incision	Groin-2/19/97	groin		disease	pCMVSPORT 3.0

H0589	CD34 positive cells (cord blood),re-ex	CD34 Positive Cells	Cord Blood			ZAP Express
H0590	Human adult small intestine,re-excision	Human Adult Small Intestine	Small Int.			Uni-ZAP XR
H0591	Human T-cell lymphoma;re-excision	T-Cell Lymphoma	T-Cell		disease	Uni-ZAP XR
H0592	Healing groin wound - zero hr post-incision (control)	HGS wound healing project; abdomen			disease	pCMVSPORT 3.0
H0593	Olfactory epithelium;nasalcavity	Olfactory epithelium from roof of left nasal cavity				pCMVSPORT 3.0
H0594	Human Lung Cancer;re-excision	Human Lung Cancer	Lung		disease	Lambda ZAP II
H0595	Stomach cancer (human);re-excision	Stomach Cancer - 5383A (human)			disease	Uni-ZAP XR
H0596	Human Colon Cancer;re-excision	Human Colon Cancer	Colon			Lambda ZAP II
H0597	Human Colon; re-excision	Human Colon				Lambda ZAP II
H0598	Human Stomach;re-excision	Human Stomach	Stomach			Uni-ZAP XR
H0599	Human Adult Heart;re-excision	Human Adult Heart	Heart			Uni-ZAP XR
H0600	Healing Abdomen wound;70&90 min post incision	Abdomen			disease	pCMVSPORT 3.0
H0606	Human Primary Breast Cancer;re-excision	Human Primary Breast Cancer	Breast		disease	Uni-ZAP XR
H0608	H. Leukocytes, control	H.Leukocytes				pCMVSPORT 1
H0613	H.Leukocytes, normalized cot 5B	H.Leukocytes				pCMVSPORT 1
H0614	H. Leukocytes, normalized cot 500 A	H.Leukocytes				pCMVSPORT 1
H0615	Human Ovarian Cancer Reexcision	Ovarian Cancer	Ovary		disease	Uni-ZAP XR
H0616	Human Testes, Reexcision	Human Testes	Testis			Uni-ZAP XR
H0617	Human Primary Breast Cancer Reexcision	Human Primary Breast Cancer	Breast		disease	Uni-ZAP XR
H0618	Human Adult Testes, Large Inserts, Reexcision	Human Adult Testis	Testis			Uni-ZAP XR
H0619	Fetal Heart	Human Fetal Heart	Heart			Uni-ZAP XR
H0620	Human Fetal Kidney; Reexcision	Human Fetal Kidney	Kidney			Uni-ZAP XR
H0622	Human Pancreas Tumor; Reexcision	Human Pancreas Tumor	Pancreas		disease	Uni-ZAP XR
H0623	Human Umbilical Vein; Reexcision	Human Umbilical Vein Endothelial Cells	Umbilical vein			Uni-ZAP XR
H0624	12 Week Early Stage Human II; Reexcision	Twelve Week Old Early Stage Human	Embryo			Uni-ZAP XR
H0625	Ku 812F Basophils Line	Ku 812F Basophils				pSport1
H0626	Saos2 Cells; Untreated	Saos2 Cell Line; Untreated				pSport1

H0627	Saos2 Cells; Vitamin D3 Treated	Saos2 Cell Line; Vitamin D3 Treated				pSport1
H0628	Human Pre-Differentiated Adipocytes	Human Pre-Differentiated Adipocytes				Uni-ZAP XR
H0631	Saos2, Dexamethosome Treated	Saos2 Cell Line; Dexamethosome Treated				pSport1
H0632	Hepatocellular Tumor; re-excision	Hepatocellular Tumor	Liver			Lambda ZAP II
H0633	Lung Carcinoma A549 TNFalpha activated	TNFalpha activated A549--Lung Carcinoma			disease	pSport1
H0634	Human Testes Tumor, re-excision	Human Testes Tumor	Testis		disease	Uni-ZAP XR
H0635	Human Activated T-Cells, re-excision	Activated T-Cells	Blood	Cell Line		Uni-ZAP XR
H0637	Dendritic Cells From CD34 Cells	Dendritic cells from CD34 cells				pSport1
H0638	CD40 activated monocyte dendritic cells	CD40 activated monocyte dendritic cells				pSport1
H0641	LPS activated derived dendritic cells	LPS activated monocyte derived dendritic cells				pSport1
H0642	Hep G2 Cells, lambda library	Hep G2 Cells				Other
H0643	Hep G2 Cells, PCR library	Hep G2 Cells				Other
H0644	Human Placenta (re-excision)	Human Placenta	Placenta			Uni-ZAP XR
H0645	Fetal Heart, re-excision	Human Fetal Heart	Heart			Uni-ZAP XR
H0646	Lung, Cancer (4005313 A3): Invasive Poorly Differentiated Lung Adenocarcinoma,	Metastatic squamous cell lung carcinoma, poorly di				pSport1
H0647	Lung, Cancer (4005163 B7): Invasive, Poorly Diff. Adenocarcinoma, Metastatic	Invasive poorly differentiated lung adenocarcinoma			disease	pSport1
H0648	Ovary, Cancer: (4004562 B6) Papillary Serous Cystic Neoplasm, Low Malignant Pot	Papillary Cstic neoplasm of low malignant potentia			disease	pSport1
H0649	Lung, Normal: (4005313 B1)	Normal Lung				pSport1
H0650	B-Cells	B-Cells				pCMVSPORT 3.0
H0651	Ovary, Normal: (9805C040R)	Normal Ovary				pSport1
H0652	Lung, Normal: (4005313 B1)	Normal Lung				pSport1
H0653	Stromal Cells	Stromal Cells				pSport1
H0654	Lung, Cancer: (4005313 A3) Invasive Poorly-	Metastatic Squamous cell lung				Other

	differentiated Metastatic lung adenoc	Carcinoma poorly dif				
H0656	B-cells (unstimulated)	B-cells (unstimulated)				pSport1
H0657	B-cells (stimulated)	B-cells (stimulated)				pSport1
H0658	Ovary, Cancer (9809C332): Poorly differentiated adenocarcinoma	9809C332- Poorly differentiate	Ovary & Fallopian Tubes		disease	pSport1
H0659	Ovary, Cancer (15395A1F): Grade II Papillary Carcinoma	Grade II Papillary Carcinoma, Ovary	Ovary		disease	pSport1
H0660	Ovary, Cancer: (15799A1F) Poorly differentiated carcinoma	Poorly differentiated carcinoma, ovary			disease	pSport1
H0661	Breast, Cancer: (4004943 A5)	Breast cancer			disease	pSport1
H0662	Breast, Normal: (4005522B2)	Normal Breast - #4005522(B2)	Breast			pSport1
H0663	Breast, Cancer: (4005522 A2)	Breast Cancer - #4005522(A2)	Breast		disease	pSport1
H0664	Breast, Cancer: (9806C012R)	Breast Cancer	Breast		disease	pSport1
H0665	Stromal cells 3.88	Stromal cells 3.88				pSport1
H0666	Ovary, Cancer: (4004332 A2)	Ovarian Cancer, Sample #4004332A2			disease	pSport1
H0667	Stromal cells(HBM3.18)	Stromal cell(HBM 3.18)				pSport1
H0668	stromal cell clone 2.5	stromal cell clone 2.5				pSport1
H0669	Breast, Cancer: (4005385 A2)	Breast Cancer (4005385A2)	Breast			pSport1
H0670	Ovary, Cancer(4004650 A3): Well-Differentiated Micropapillary Serous Carcinoma	Ovarian Cancer - 4004650A3				pSport1
H0671	Breast, Cancer: (9802C02OE)	Breast Cancer-Sample # 9802C02OE				pSport1
H0672	Ovary, Cancer: (4004576 A8)	Ovarian Cancer(4004576A8)	Ovary			pSport1
H0673	Human Prostate Cancer, Stage B2; re-excision	Human Prostate Cancer, stage B2	Prostate			Uni-ZAP XR
H0674	Human Prostate Cancer, Stage C; re-excision	Human Prostate Cancer, stage C	Prostate			Uni-ZAP XR
H0675	Colon, Cancer: (9808C064R)	Colon Cancer 9808C064R				pCMVSPORT 3.0
H0676	Colon, Cancer: (9808C064R)-total RNA	Colon Cancer 9808C064R				pCMVSPORT 3.0
H0677	TNFR degenerate oligo	B-Cells				PCR II
H0682	Serous Papillary Adenocarcinoma	serous papillary adenocarcinoma				pCMVSPORT 3.0

		(9606G304SPA3B)				
H0683	Ovarian Serous Papillary Adenocarcinoma	Serous papillary adenocarcinoma, stage 3C (9804G01				pCMVSPORT 3.0
H0684	Serous Papillary Adenocarcinoma	Ovarian Cancer-9810G606	Ovaries			pCMVSPORT 3.0
H0685	Adenocarcinoma of Ovary, Human Cell Line, # OVCA-3	Adenocarcinoma of Ovary, Human Cell Line, # OVCA-3				pCMVSPORT 3.0
H0686	Adenocarcinoma of Ovary, Human Cell Line	Adenocarcinoma of Ovary, Human Cell Line, # SW-626				pCMVSPORT 3.0
H0687	Human normal ovary(#9610G215)	Human normal ovary(#9610G215)	Ovary			pCMVSPORT 3.0
H0688	Human Ovarian Cancer(#9807G017)	Human Ovarian cancer(#9807G017), mRNA from Maura Ru				pCMVSPORT 3.0
H0689	Ovarian Cancer	Ovarian Cancer, #9806G019				pCMVSPORT 3.0
H0690	Ovarian Cancer, #9702G001	Ovarian Cancer, #9702G001				pCMVSPORT 3.0
H0691	Normal Ovary, #9710G208	normal ovary, #9710G208				pCMVSPORT 3.0
H0693	Normal Prostate #ODQ3958EN	Normal Prostate Tissue # ODQ3958EN				pCMVSPORT 3.0
H0694	Prostate gland adenocarcinoma	Prostate gland, adenocarcinoma, mod/diff, gleason	prostate gland			pCMVSPORT 3.0
H0695	mononucleocytes from patient	mononucleocytes from patient at Shady Grove Hospit				pCMVSPORT 3.0
N0006	Human Fetal Brain	Human Fetal Brain				
S0001	Brain frontal cortex	Brain frontal cortex	Brain			Lambda ZAP II
S0002	Monocyte activated	Monocyte-activated	blood	Cell Line		Uni-ZAP XR
S0003	Human Osteoclastoma	Osteoclastoma	bone		disease	Uni-ZAP XR
S0004	Prostate	Prostate BPH	Prostate			Lambda ZAP II
S0007	Early Stage Human Brain	Human Fetal Brain				Uni-ZAP XR
S0010	Human Amygdala	Amygdala				Uni-ZAP XR
S0011	STROMAL - OSTEOCLASTOMA	Osteoclastoma	bone		disease	Uni-ZAP XR
S0015	Kidney medulla	Kidney medulla	Kidney			Uni-ZAP XR
S0016	Kidney Pyramids	Kidney pyramids	Kidney			Uni-ZAP XR
S0021	Whole brain	Whole brain	Brain			ZAP Express
S0026	Stromal cell TF274	stromal cell	Bone marrow	Cell Line		Uni-ZAP XR
S0027	Smooth muscle, serum treated	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0028	Smooth muscle, control	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0031	Spinal cord	Spinal cord	spinal cord			Uni-ZAP XR
S0032	Smooth muscle-ILb induced	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR

S0035	Brain medulla oblongata	Brain medulla oblongata	Brain			Uni-ZAP XR
S0036	Human Substantia Nigra	Human Substantia Nigra				Uni-ZAP XR
S0037	Smooth muscle, IL1b induced	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0038	Human Whole Brain #2 - Oligo dT > 1.5Kb	Human Whole Brain #2				ZAP Express
S0040	Adipocytes	Human Adipocytes from Osteoclastoma				Uni-ZAP XR
S0042	Testes	Human Testes				ZAP Express
S0044	Prostate BPH	prostate BPH	Prostate		disease	Uni-ZAP XR
S0045	Endothelial cells-control	Endothelial cell	endothelial cell-lung	Cell Line		Uni-ZAP XR
S0046	Endothelial-induced	Endothelial cell	endothelial cell-lung	Cell Line		Uni-ZAP XR
S0048	Human Hypothalamus, Alzheimer's	Human Hypothalamus, Alzheimer's			disease	Uni-ZAP XR
S0049	Human Brain, Striatum	Human Brain, Striatum				Uni-ZAP XR
S0050	Human Frontal Cortex, Schizophrenia	Human Frontal Cortex, Schizophrenia			disease	Uni-ZAP XR
S0051	Human Hypothalamus, Schizophrenia	Human Hypothalamus, Schizophrenia			disease	Uni-ZAP XR
S0052	neutrophils control	human neutrophils	blood	Cell Line		Uni-ZAP XR
S0053	Neutrophils IL-1 and LPS induced	human neutrophil induced	blood	Cell Line		Uni-ZAP XR
S0110	Brain Amygdala Depression		Brain		disease	Uni-ZAP XR
S0114	Anergic T-cell	Anergic T-cell		Cell Line		Uni-ZAP XR
S0116	Bone marrow	Bone marrow	Bone marrow			Uni-ZAP XR
S0126	Osteoblasts	Osteoblasts	Knee	Cell Line		Uni-ZAP XR
S0132	Epithelial-TNF α and INF induced	Airway Epithelial				Uni-ZAP XR
S0134	Apoptotic T-cell	apoptotic cells		Cell Line		Uni-ZAP XR
S0140	eosinophil-IL5 induced	eosinophil	lung	Cell Line		Uni-ZAP XR
S0142	Macrophage-oxLDL	macrophage-oxidized LDL treated	blood	Cell Line		Uni-ZAP XR
S0144	Macrophage (GM-CSF treated)	Macrophage (GM-CSF treated)				Uni-ZAP XR
S0146	prostate-edited	prostate BPH	Prostate			Uni-ZAP XR
S0148	Normal Prostate	Prostate	prostate			Uni-ZAP XR
S0150	LNCAP prostate cell line	LNCAP Cell Line	Prostate	Cell Line		Uni-ZAP XR
S0152	PC3 Prostate cell line	PC3 prostate cell line				Uni-ZAP XR
S0176	Prostate, normal, subtraction I	Prostate	prostate			Uni-ZAP XR
S0182	Human B Cell 8866	Human B- Cell 8866				Uni-ZAP XR
S0188	Prostate,BPH, Lib 2	Human Prostate			disease	pSport1

		BPH				
S0192	Synovial Fibroblasts (control)	Synovial Fibroblasts				pSport1
S0194	Synovial hypoxia	Synovial Fibroblasts				pSport1
S0196	Synovial IL-1/TNF stimulated	Synovial Fibroblasts				pSport1
S0206	Smooth Muscle- HASTE normalized	Smooth muscle	Pulmonary artery	Cell Line		pBluescript
S0210	Mesangial cell, frac 2	Mesangial cell				pSport1
S0212	Bone Marrow Stromal Cell, untreated	Bone Marrow Stromal Cell, untreated				pSport1
S0214	Human Osteoclastoma, re-excision	Osteoclastoma	bone		disease	Uni-ZAP XR
S0216	Neutrophils IL-1 and LPS induced	human neutrophil induced	blood	Cell Line		Uni-ZAP XR
S0218	Apoptotic T-cell, re-excision	apoptotic cells		Cell Line		Uni-ZAP XR
S0222	H. Frontal cortex, epileptic; re-excision	H. Brain, Frontal Cortex, Epileptic	Brain		disease	Uni-ZAP XR
S0242	Synovial Fibroblasts (III/TNF), subt	Synovial Fibroblasts				pSport1
S0250	Human Osteoblasts II	Human Osteoblasts	Femur		disease	pCMVSPORT 2.0
S0260	Spinal Cord, re-excision	Spinal cord	spinal cord			Uni-ZAP XR
S0276	Synovial hypoxia-RSF subtracted	Synovial fibroblasts (rheumatoid)	Synovial tissue			pSport1
S0278	H Macrophage (GM-CSF treated), re-excision	Macrophage (GM-CSF treated)				Uni-ZAP XR
S0280	Human Adipose Tissue, re-excision	Human Adipose Tissue				Uni-ZAP XR
S0282	Brain Frontal Cortex, re-excision	Brain frontal cortex	Brain			Lambda ZAP II
S0294	Larynx tumor	Larynx tumor	Larynx, vocal cord		disease	pSport1
S0298	Bone marrow stroma, treated	Bone marrow stroma, treated SB	Bone marrow			pSport1
S0300	Frontal lobe, dementia; re-excision	Frontal Lobe dementia/Alzheimer's	Brain			Uni-ZAP XR
S0306	Larynx normal #10 261-273	Larynx normal				pSport1
S0310	Normal trachea	Normal trachea				pSport1
S0312	Human osteoarthritic; fraction II	Human osteoarthritic cartilage			disease	pSport1
S0314	Human osteoarthritis; fraction I	Human osteoarthritic cartilage			disease	pSport1
S0316	Human Normal Cartilage, Fraction I	Human Normal Cartilage				pSport1
S0324	Human Brain	Brain	Cerebellum			pSport1
S0328	Palate carcinoma	Palate carcinoma	Uvula		disease	pSport1

S0330	Palate normal	Palate normal	Uvula			pSport1
S0332	Pharynx carcinoma	Pharynx carcinoma	Hypopharynx			pSport1
S0340	Human Osteoarthritic Cartilage Fraction IV	Human osteoarthritic cartilage			disease	pSport1
S0342	Adipocytes;re-excision	Human Adipocytes from Osteoclastoma				Uni-ZAP XR
S0344	Macrophage-oxLDL; re- excision	macrophage- oxidized LDL treated	blood	Cell Line		Uni-ZAP XR
S0346	Human Amygdala;re- excision	Amygdala				Uni-ZAP XR
S0348	Cheek Carcinoma	Cheek Carcinoma			disease	pSport1
S0352	Larynx Carcinoma	Larynx carcinoma			disease	pSport1
S0354	Colon Normal II	Colon Normal	Colon			pSport1
S0356	Colon Carcinoma	Colon Carcinoma	Colon		disease	pSport1
S0358	Colon Normal III	Colon Normal	Colon			pSport1
S0360	Colon Tumor II	Colon Tumor	Colon		disease	pSport1
S0362	Human Gastrocnemius	Gastrocnemius muscle				pSport1
S0364	Human Quadriceps	Quadriceps muscle				pSport1
S0366	Human Soleus	Soleus Muscle				pSport1
S0370	Larynx carcinoma II	Larynx carcinoma			disease	pSport1
S0372	Larynx carcinoma III	Larynx carcinoma			disease	pSport1
S0374	Normal colon	Normal colon				pSport1
S0376	Colon Tumor	Colon Tumor			disease	pSport1
S0378	Pancreas normal PCA4 No	Pancreas Normal PCA4 No				pSport1
S0380	Pancreas Tumor PCA4 Tu	Pancreas Tumor PCA4 Tu			disease	pSport1
S0384	Tongue carcinoma	Tongue carcinoma			disease	pSport1
S0386	Human Whole Brain, re- excision	Whole brain	Brain			ZAP Express
S0388	Human Hypothalamus,schizophre nia, re-excision	Human Hypothalamus, Schizophrenia			disease	Uni-ZAP XR
S0390	Smooth muscle, control; re-excision	Smooth muscle	Pulmonary artery	Cell Line		Uni-ZAP XR
S0398	Testis; normal	Testis; normal				pSport1
S0400	Brain; normal	Brain; normal				pSport1
S0404	Rectum normal	Rectum, normal				pSport1
S0406	Rectum tumour	Rectum tumour				pSport1
S0408	Colon, normal	Colon, normal				pSport1
S0410	Colon, tumour	Colon, tumour				pSport1
S0412	Temporal cortex- Alzheimer; subtracted	Temporal cortex, alzheimer			disease	Other
S0414	Hippocampus, Alzheimer Subtracted	Hippocampus, Alzheimer Subtracted				Other
S0418	CHME Cell Line;treated 5 hrs	CHME Cell Line; treated				pCMVSport 3.0
S0420	CHME Cell	CHME Cell line,				pSport1

	Line, untreated	untreated				
S0422	Mo7e Cell Line GM-CSF treated (1ng/ml)	Mo7e Cell Line GM-CSF treated (1ng/ml)				pCMV Sport 3.0
S0424	TF-1 Cell Line GM-CSF Treated	TF-1 Cell Line GM-CSF Treated				pSport1
S0426	Monocyte activated; re-excision	Monocyte-activated	blood	Cell Line		Uni-ZAP XR
S0428	Neutrophils control; re-excision	human neutrophils	blood	Cell Line		Uni-ZAP XR
S0430	Aryepiglottis Normal	Aryepiglottis Normal				pSport1
S0432	Sinus piniformis Tumour	Sinus piniformis Tumour				pSport1
S0434	Stomach Normal	Stomach Normal			disease	pSport1
S0436	Stomach Tumour	Stomach Tumour			disease	pSport1
S0438	Liver Normal Met5No	Liver Normal Met5No				pSport1
S0440	Liver Tumour Met 5 Tu	Liver Tumour				pSport1
S0442	Colon Normal	Colon Normal				pSport1
S0444	Colon Tumor	Colon Tumour			disease	pSport1
S0446	Tongue Tumour	Tongue Tumour				pSport1
S0448	Larynx Normal	Larynx Normal				pSport1
S0450	Larynx Tumour	Larynx Tumour				pSport1
S0456	Tongue Normal	Tongue Normal				pSport1
S0458	Thyroid Normal (SDCA2 No)	Thyroid normal				pSport1
S0460	Thyroid Tumour	Thyroid Tumour				pSport1
S0468	Ea.hy.926 cell line	Ea.hy.926 cell line				pSport1
S0474	Human blood platelets	Platelets	Blood platelets			Other
S3010	Human Blastocyst	Human Blastocyst				Other
S3012	Smooth Muscle Serum Treated, Norm	Smooth muscle	Pulmonary artery	Cell Line		pBluescript
S3014	Smooth muscle, serum induced, re-exc	Smooth muscle	Pulmonary artery	Cell Line		pBluescript
S6014	H. hypothalamus, frac A	Hypothalamus	Brain			ZAP Express
S6016	H. Frontal Cortex, Epileptic	H. Brain, Frontal Cortex, Epileptic	Brain		disease	Uni-ZAP XR
S6022	H. Adipose Tissue	Human Adipose Tissue				Uni-ZAP XR
S6024	Alzheimers, spongy change	Alzheimer's/Spongy change	Brain		disease	Uni-ZAP XR
S6026	Frontal Lobe, Dementia	Frontal Lobe dementia/Alzheimer's	Brain			Uni-ZAP XR
S6028	Human Manic Depression Tissue	Human Manic depression tissue	Brain		disease	Uni-ZAP XR
T0002	Activated T-cells	Activated T-Cell, PBL fraction	Blood	Cell Line		pBluescript SK-
T0003	Human Fetal Lung	Human Fetal Lung				pBluescript SK-
T0006	Human Pineal Gland	Human Pineal				pBluescript SK-

		Gland				
T0008	Colorectal Tumor	Colorectal Tumor			disease	pBluescript SK-
T0010	Human Infant Brain	Human Infant Brain				Other
T0023	Human Pancreatic Carcinoma	Human Pancreatic Carcinoma			disease	pBluescript SK-
T0039	HSA 172 Cells	Human HSA172 cell line				pBluescript SK-
T0040	HSC172 cells	SA172 Cells				pBluescript SK-
T0041	Jurkat T-cell G1 phase	Jurkat T-cell				pBluescript SK-
T0042	Jurkat T-Cell, S phase	Jurkat T-Cell Line				pBluescript SK-
T0048	Human Aortic Endothelium	Human Aortic Endothilium				pBluescript SK-
T0049	Aorta endothelial cells + TNF-a	Aorta endothelial cells				pBluescript SK-
T0060	Human White Adipose	Human White Fat				pBluescript SK-
T0067	Human Thyroid	Human Thyroid				pBluescript SK-
T0068	Normal Ovary, Premenopausal	Normal Ovary, Premenopausal				pBluescript SK-
T0069	Human Uterus, normal	Human Uterus, normal				pBluescript SK-
T0071	Human Bone Marrow	Human Bone Marrow				pBluescript SK-
T0074	Human Adult Retina	Human Adult Retina				pBluescript SK-
T0078	Human Liver, normal adult	Human Liver, normal Adult				pBluescript SK-
T0082	Human Adult Retina	Human Adult Retina				pBluescript SK-
T0109	Human (HCC) cell line liver (mouse) metastasis, remake					pBluescript SK-
T0110	Human colon carcinoma (HCC) cell line, remake					pBluescript SK-
T0114	Human (Caco-2) cell line, adenocarcinoma, colon, remake					pBluescript SK-
T0115	Human Colon Carcinoma (HCC) cell line					pBluescript SK-
L0005	Clontech human aorta polyA+ mRNA (#6572)					
L0021	Human adult (K.Okubo)					
L0040	Human colon mucosa					
L0055	Human promyelocyte					
L0060	Human thymus NSTH II					
L0065	Liver HepG2 cell line.					
L0105	Human aorta polyA+ (TFujiwara)	aorta				
L0142	Human placenta cDNA (TFujiwara)	placenta				
L0146	Human fovea cDNA	retinal fovea				
L0151	Human testis (C. De Smet)	testis				
L0157	Human fetal brain (TFujiwara)		brain			

L0163	Human heart cDNA (YNakamura)		heart			
L0174	AP20 melanoma mRNA			AP20 melanoma		
L0185	Human immortalized fibroblasts (H.L.Ozer)			HS74 and its SV40- transformed sublines		
L0351	Infant brain, Bento Soares					BA, M13- derived
L0352	Normalized infant brain, Bento Soares					BA, M13- derived
L0356	S, Human foetal Adrenals tissue					Bluescript
L0361	Stratagene ovary (#937217)		ovary			Bluescript SK
L0362	Stratagene ovarian cancer (#937219)					Bluescript SK-
L0363	NCI_CGAP_GC2	germ cell tumor				Bluescript SK-
L0364	NCI_CGAP_GC5	germ cell tumor				Bluescript SK-
L0366	Stratagene schizo brain S11	schizophrenic brain S-11 frontal lobe				Bluescript SK-
L0367	NCI_CGAP_Sch1	Schwannoma tumor				Bluescript SK-
L0368	NCI_CGAP_SS1	synovial sarcoma				Bluescript SK-
L0369	NCI_CGAP_AA1	adrenal adenoma	adrenal gland			Bluescript SK-
L0370	Johnston frontal cortex	pooled frontal lobe	brain			Bluescript SK-
L0372	NCI_CGAP_Co12	colon tumor	colon			Bluescript SK-
L0373	NCI_CGAP_Co11	tumor	colon			Bluescript SK-
L0374	NCI_CGAP_Co2	tumor	colon			Bluescript SK-
L0375	NCI_CGAP_Kid6	kidney tumor	kidney			Bluescript SK-
L0376	NCI_CGAP_Lar1	larynx	larynx			Bluescript SK-
L0378	NCI_CGAP_Lu1	lung tumor	lung			Bluescript SK-
L0381	NCI_CGAP_HN4	squamous cell carcinoma	pharynx			Bluescript SK-
L0382	NCI_CGAP_Pr25	epithelium (cell line)	prostate			Bluescript SK-
L0383	NCI_CGAP_Pr24	invasive tumor (cell line)	prostate			Bluescript SK-
L0384	NCI_CGAP_Pr23	prostate tumor	prostate			Bluescript SK-
L0386	NCI_CGAP_HN3	squamous cell carcinoma from base of tongue	tongue			Bluescript SK-
L0387	NCI_CGAP_GCB0	germinal center B- cells	tonsil			Bluescript SK-
L0388	NCI_CGAP_HN6	normal gingiva (cell line from immortalized kerati				Bluescript SK-
L0393	B, Human Liver tissue					gt11
L0415	b4HB3MA Cot8-HAP-Ft					Lafmid BA
L0418	b4HB3MA-Cot109+10- Bio					Lafmid BA

L0435	Infant brain, LLNL array of Dr. M. Soares 1NIB					lafmid BA
L0438	normalized infant brain cDNA	total brain	brain			lafmid BA
L0439	Soares infant brain 1NIB		whole brain			Lafmid BA
L0443	b4HB3MK					Lafmid BK
L0455	Human retina cDNA randomly primed sublibrary	retina	eye			lambda gt10
L0462	WATM1					lambda gt11
L0465	TEST1, Human adult Testis tissue					lambda nm1149
L0468	HE6W					lambda zap
L0471	Human fetal heart, Lambda ZAP Express					Lambda ZAP Express
L0475	KG1-a Lambda Zap Express cDNA library			KG1-a		Lambda Zap Express (Stratagene)
L0480	Stratagene cat#937212 (1992)					Lambda ZAP, pBluescript SK(-)
L0483	Human pancreatic islet					Lambda ZAPII
L0485	STRATAGENE Human skeletal muscle cDNA library, cat. #936215.	skeletal muscle	leg muscle			Lambda ZAPII
L0493	NCI_CGAP_Ov26	papillary serous carcinoma	ovary			pAMP1
L0499	NCI_CGAP_HSC2	stem cell 34+/38+	bone marrow			pAMP1
L0509	NCI_CGAP_Lu26	invasive adenocarcinoma	lung			pAMP1
L0513	NCI_CGAP_Ov37	early stage papillary serous carcinoma	ovary			pAMP1
L0517	NCI_CGAP_Pr1					pAMP10
L0518	NCI_CGAP_Pr2					pAMP10
L0519	NCI_CGAP_Pr3					pAMP10
L0520	NCI_CGAP_Alv1	alveolar rhabdomyosarcoma				pAMP10
L0521	NCI_CGAP_Ew1	Ewing's sarcoma				pAMP10
L0522	NCI_CGAP_Kid1	kidney				pAMP10
L0523	NCI_CGAP_Lip2	liposarcoma				pAMP10
L0524	NCI_CGAP_Li1	liver				pAMP10
L0525	NCI_CGAP_Li2	liver				pAMP10
L0526	NCI_CGAP_Pr12	metastatic prostate bone lesion				pAMP10
L0527	NCI_CGAP_Ov2	ovary				pAMP10
L0528	NCI_CGAP_Pr5	prostate				pAMP10
L0529	NCI_CGAP_Pr6	prostate				pAMP10
L0530	NCI_CGAP_Pr8	prostate				pAMP10
L0532	NCI_CGAP_Thy1	thyroid				pAMP10
L0533	NCI_CGAP_HSC1	stem cells	bone marrow			pAMP10
L0534	Chromosome 7 Fetal Brain cDNA Library	brain	brain			pAMP10

L0539	Chromosome 7 Placental cDNA Library		placenta			pAMP10
L0540	NCL_CGAP_Pr10	invasive prostate tumor	prostate			pAMP10
L0541	NCL_CGAP_Pr7	low-grade prostatic neoplasia	prostate			pAMP10
L0543	NCL_CGAP_Pr9	normal prostatic epithelial cells	prostate			pAMP10
L0545	NCL_CGAP_Pr4.1	prostatic intraepithelial neoplasia - high grade	prostate			pAMP10
L0546	NCL_CGAP_Pr18	stroma	prostate			pAMP10
L0550	NCL_CGAP_HN9	normal squamous epithelium from retromolar trigone				pAMP10
L0551	NCL_CGAP_HN7	normal squamous epithelium, floor of mouth				pAMP10
L0554	NCL_CGAP_Li8		liver			pAMP10
L0562	Chromosome 7 HeLa cDNA Library			HeLa cell line; ATCC		pAMP10
L0564	Jia bone marrow stroma	bone marrow stroma				pBluescript
L0565	Normal Human Trabecular Bone Cells	Bone	Hip			pBluescript
L0581	Stratagene liver (#937224)		liver			pBluescript SK
L0583	Stratagene cDNA library Human fibroblast, cat#937212					pBluescript SK(+)
L0584	Stratagene cDNA library Human heart, cat#936208					pBluescript SK(+)
L0586	HTCDL1					pBluescript SK(-)
L0587	Stratagene colon HT29 (#937221)					pBluescript SK-
L0588	Stratagene endothelial cell 937223					pBluescript SK-
L0589	Stratagene fetal retina 937202					pBluescript SK-
L0591	Stratagene HeLa cell s3 937216					pBluescript SK-
L0592	Stratagene hNT neuron (#937233)					pBluescript SK-
L0593	Stratagene neuroepithelium (#937231)					pBluescript SK-
L0594	Stratagene neuroepithelium NT2RAMI 937234					pBluescript SK-
L0595	Stratagene NT2 neuronal precursor 937230	neuroepithelial cells	brain			pBluescript SK-
L0596	Stratagene colon		colon			pBluescript SK-

	(#937204)					
L0598	Morton Fetal Cochlea	cochlea	ear			pBluescript SK-
L0599	Stratagene lung (#937210)		lung			pBluescript SK-
L0600	Weizmann Olfactory Epithelium	olfactory epithelium	nose			pBluescript SK-
L0601	Stratagene pancreas (#937208)		pancreas			pBluescript SK-
L0602	Pancreatic Islet	pancreatic islet	pancreas			pBluescript SK-
L0603	Stratagene placenta (#937225)		placenta			pBluescript SK-
L0604	Stratagene muscle 937209	muscle	skeletal muscle			pBluescript SK-
L0605	Stratagene fetal spleen (#937205)	fetal spleen	spleen			pBluescript SK-
L0606	NCI_CGAP_Lym5	follicular lymphoma	lymph node			pBluescript SK-
L0608	Stratagene lung carcinoma 937218	lung carcinoma	lung	NCI-H69		pBluescript SK-
L0612	Schiller oligodendroglioma	oligodendroglioma	brain			pBluescript SK- (Stratagene)
L0615	22 week old human fetal liver cDNA library					pBluescriptII SK(-)
L0617	Chromosome 22 exon					pBluescriptIIKS +
L0622	HM1					pcDNAII (Invitrogen)
L0623	HM3	pectoral muscle (after mastectomy)				pcDNAII (Invitrogen)
L0626	NCI_CGAP_GC1	bulk germ cell seminoma				pCMV-SPORT2
L0629	NCI_CGAP_Mel3	metastatic melanoma to bowel	bowel (skin primary)			pCMV-SPORT4
L0631	NCI_CGAP_Br7		breast			pCMV-SPORT4
L0632	NCI_CGAP_Li5	hepatic adenoma	liver			pCMV-SPORT4
L0634	NCI_CGAP_Ov8	serous adenocarcinoma	ovary			pCMV-SPORT4
L0636	NCI_CGAP_Pit1	four pooled pituitary adenomas	brain			pCMV-SPORT6
L0637	NCI_CGAP_Brn53	three pooled meningiomas	brain			pCMV-SPORT6
L0638	NCI_CGAP_Brn35	tumor, 5 pooled (see description)	brain			pCMV-SPORT6
L0639	NCI_CGAP_Brn52	tumor, 5 pooled (see description)	brain			pCMV-SPORT6
L0640	NCI_CGAP_Br18	four pooled high-grade tumors, including two prima	breast			pCMV-SPORT6
L0641	NCI_CGAP_Co17	juvenile granulosa tumor	colon			pCMV-SPORT6
L0642	NCI_CGAP_Co18	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0643	NCI_CGAP_Co19	moderately differentiated	colon			pCMV-SPORT6

		adenocarcinoma				
L0644	NCI_CGAP_Co20	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0645	NCI_CGAP_Co21	moderately differentiated adenocarcinoma	colon			pCMV-SPORT6
L0646	NCI_CGAP_Co14	moderately-differentiated adenocarcinoma	colon			pCMV-SPORT6
L0647	NCI_CGAP_Sar4	five pooled sarcomas, including myxoid liposarcoma	connective tissue			pCMV-SPORT6
L0648	NCI_CGAP_Eso2	squamous cell carcinoma	esophagus			pCMV-SPORT6
L0649	NCI_CGAP_GU1	2 pooled high-grade transitional cell tumors	genitourinary tract			pCMV-SPORT6
L0650	NCI_CGAP_Kid13	2 pooled Wilms" tumors, one primary and one metast	kidney			pCMV-SPORT6
L0651	NCI_CGAP_Kid8	renal cell tumor	kidney			pCMV-SPORT6
L0653	NCI_CGAP_Lu28	two pooled squamous cell carcinomas	lung			pCMV-SPORT6
L0655	NCI_CGAP_Lym12	lymphoma, follicular mixed small and large cell	lymph node			pCMV-SPORT6
L0656	NCI_CGAP_Ov38	normal epithelium	ovary			pCMV-SPORT6
L0657	NCI_CGAP_Ov23	tumor, 5 pooled (see description)	ovary			pCMV-SPORT6
L0658	NCI_CGAP_Ov35	tumor, 5 pooled (see description)	ovary			pCMV-SPORT6
L0659	NCI_CGAP_Pan1	adenocarcinoma	pancreas			pCMV-SPORT6
L0661	NCI_CGAP_Mel15	malignant melanoma, metastatic to lymph node	skin			pCMV-SPORT6
L0662	NCI_CGAP_Gas4	poorly differentiated adenocarcinoma with signet r	stomach			pCMV-SPORT6
L0663	NCI_CGAP_Ut2	moderately-differentiated endometrial adenocarcino	uterus			pCMV-SPORT6
L0664	NCI_CGAP_Ut3	poorly-differentiated endometrial adenocarcinoma,	uterus			pCMV-SPORT6
L0665	NCI_CGAP_Ut4	serous papillary carcinoma, high grade, 2 pooled t	uterus			pCMV-SPORT6
L0666	NCI_CGAP_Ut1	well-differentiated endometrial	uterus			pCMV-SPORT6

		adenocarcinoma, 7				
L0667	NCI_CGAP_CML1	myeloid cells, 18 pooled CML cases, BCR/ABL rearra	whole blood			pCMV-SPORT6
L0683	Stanley Frontal NS pool 2	frontal lobe (see description)	brain			pCR2.1-TOPO (Invitrogen)
L0686	Stanley Frontal SN pool 2	frontal lobe (see description)	brain			pCR2.1-TOPO (Invitrogen)
L0697	Testis 1					PGEM 5zf(+)
L0698	Testis 2					PGEM 5zf(+)
L0717	Gessler Wilms tumor					pSPORT1
L0719	human embryo cDNA library	Whole embryo				pSPORT1
L0731	Soares_pregnant_uterus_ NbHPU		uterus			pT7T3-Pac
L0738	Human colorectal cancer					pT7T3D
L0740	Soares melanocyte 2NbHM	melanocyte				pT7T3D (Pharmacia) with a modified polylinker
L0741	Soares adult brain N2b4HB55Y		brain			pT7T3D (Pharmacia) with a modified polylinker
L0742	Soares adult brain N2b5HB55Y		brain			pT7T3D (Pharmacia) with a modified polylinker
L0743	Soares breast 2NbHBst		breast			pT7T3D (Pharmacia) with a modified polylinker
L0744	Soares breast 3NbHBst		breast			pT7T3D (Pharmacia) with a modified polylinker
L0745	Soares retina N2b4HR	retina	eye			pT7T3D (Pharmacia) with a modified polylinker
L0746	Soares retina N2b5HR	retina	eye			pT7T3D (Pharmacia) with a modified polylinker
L0747	Soares_fetal_heart_NbHH 19W		heart			pT7T3D (Pharmacia) with a modified polylinker
L0748	Soares fetal liver spleen 1NFLS		Liver and Spleen			pT7T3D (Pharmacia) with a modified polylinker
L0749	Soares_fetal_liver_spleen		Liver and			pT7T3D

	_1NFLS_S1		Spleen			(Pharmacia) with a modified polylinker
L0750	Soares_fetal_lung_NbHL1 9W		lung			pT7T3D (Pharmacia) with a modified polylinker
L0751	Soares ovary tumor NbHOT	ovarian tumor	ovary			pT7T3D (Pharmacia) with a modified polylinker
L0752	Soares_parathyroid_tumor _NbHPA	parathyroid tumor	parathyroid gland			pT7T3D (Pharmacia) with a modified polylinker
L0753	Soares_pineal_gland_N3H PG		pineal gland			pT7T3D (Pharmacia) with a modified polylinker
L0754	Soares placenta Nb2HP		placenta			pT7T3D (Pharmacia) with a modified polylinker
L0755	Soares_placenta_8to9wee ks_2NbHP8to9W		placenta			pT7T3D (Pharmacia) with a modified polylinker
L0756	Soares_multiple_sclerosis _2NbHMSP	multiple sclerosis lesions				pT7T3D (Pharmacia) with a modified polylinker V_TYPE
L0757	Soares_senescent_fibrobla sts_NbHSF	senescent fibroblast				pT7T3D (Pharmacia) with a modified polylinker V_TYPE
L0758	Soares_testis_NHT					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0759	Soares_total_fetus_Nb2H F8_9w					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0760	Barstead aorta HPLRB3	aorta				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0761	NCI_CGAP_CLL1	B-cell, chronic lymphocytic leukemia				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0762	NCI_CGAP_Br1.1	breast				pT7T3D-Pac

						(Pharmacia) with a modified polylinker
L0763	NCI_CGAP_Br2	breast				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0764	NCI_CGAP_Co3	colon				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0765	NCI_CGAP_Co4	colon				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0766	NCI_CGAP_GCB1	germinal center B cell				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0767	NCI_CGAP_GC3	pooled germ cell tumors				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0768	NCI_CGAP_GC4	pooled germ cell tumors				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0769	NCI_CGAP_Brn25	anaplastic oligodendroglioma	brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0770	NCI_CGAP_Brn23	glioblastoma (pooled)	brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0771	NCI_CGAP_Co8	adenocarcinoma	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0772	NCI_CGAP_Co10	colon tumor RER+	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0773	NCI_CGAP_Co9	colon tumor RER+	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0774	NCI_CGAP_Kid3		kidney			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0775	NCI_CGAP_Kid5	2 pooled tumors (clear cell type)	kidney			pT7T3D-Pac (Pharmacia) with a modified

						polylinker
L0776	NCI_CGAP_Lu5	carcinoid	lung			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0777	Soares_NhHMPu_S1	Pooled human melanocyte, fetal heart, and pregnant	mixed (see below)			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0779	Soares_NFL_T_GBC_S1		pooled			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0780	Soares_NSF_F8_9W_OT _PA_P_S1		pooled			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0782	NCI_CGAP_Pr21	normal prostate	prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0783	NCI_CGAP_Pr22	normal prostate	prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0784	NCI_CGAP_Lei2	leiomyosarcoma	soft tissue			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0785	Barstead spleen HPLRB2		spleen			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0786	Soares_NbHFB		whole brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0787	NCI_CGAP_Sub1					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0788	NCI_CGAP_Sub2					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0789	NCI_CGAP_Sub3					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0790	NCI_CGAP_Sub4					pT7T3D-Pac (Pharmacia) with a modified polylinker

L0791	NCI_CGAP_Sub5					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0792	NCI_CGAP_Sub6					pT7T3D-Pac (Pharmacia) with a modified polylinker
L0794	NCI_CGAP_GC6	pooled germ cell tumors				pT7T3D-Pac (Pharmacia) with a modified polylinker
L0796	NCI_CGAP_Brn50	medulloblastoma	brain			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0800	NCI_CGAP_Co16	colon tumor, RER+	colon			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0803	NCI_CGAP_Kid11		kidney			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0804	NCI_CGAP_Kid12	2 pooled tumors (clear cell type)	kidney			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0805	NCI_CGAP_Lu24	carcinoid	lung			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0806	NCI_CGAP_Lu19	squamous cell carcinoma, poorly differentiated (4	lung			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0807	NCI_CGAP_Ov18	fibrotheoma	ovary			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0808	Barstead prostate BPH HPLRB4 1		prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L0809	NCI_CGAP_Pr28		prostate			pT7T3D-Pac (Pharmacia) with a modified polylinker
L2250	Human cerebral cortex	cerebral cortex				
L2251	Human fetal lung	Fetal lung				

TABLE 5

OMIM Reference	Description
103850	Aldolase A deficiency
106165	Hypertension, essential, 145500
107470	Atypical mycobacterial infection, familial disseminated, 209950
107470	BCG infection, generalized familial
107470	Tuberculosis, susceptibility to
107777	Diabetes insipidus, nephrogenic, autosomal recessive, 222000
107970	Arrhythmogenic right ventricular dysplasia-1
108730	Brody myopathy, 601003
114835	Monocyte carboxyesterase deficiency
115650	Cataract, anterior polar-1
116800	Cataract, Marner type
117700	[Hypoceruloplasminemia, hereditary]
117700	Hemosiderosis, systemic, due to aceruloplasminemia
120110	Metaphyseal chondrodysplasia, Schmid type
121014	Heterotaxia, viscerotaxial, autosomal recessive
123270	[Creatine kinase, brain type, ectopic expression of]
123940	White sponge nevus, 193900
126451	Schizophrenia, susceptibility to
126650	Chloride diarrhea, congenital, Finnish type, 214700
126650	Colon cancer
139350	Epidermolytic hyperkeratosis, 113800
139350	Keratoderma, palmoplantar, nonepidermolytic
140100	[Anhaptoglobinemia]
140100	[Hypohaptoglobinemia]
147781	Atopy, susceptibility to
148040	Epidermolysis bullosa simplex, Koebner, Dowling-Meara, and Weber-Cockayne types, 131900, 131760, 131800
148041	Pachyonychia congenita, Jadassohn-Lewandowsky type, 167200
148043	Meesmann corneal dystrophy, 122100
148070	Liver disease, susceptibility to, from hepatotoxins or viruses
150210	Lactoferrin-deficient neutrophils, 245480
154276	Malignant hyperthermia susceptibility 3
164200	Oculodentodigital dysplasia
164200	Syndactyly, type III, 186100
169600	Hailey-Hailey disease
172471	Glycogenosis, hepatic, autosomal
173360	Thrombophilia due to excessive plasminogen activator inhibitor
173360	Hemorrhagic diathesis due to PAI1 deficiency
180380	Night blindness, congenital stationary, rhodopsin-related
180380	Retinitis pigmentosa, autosomal recessive
180380	Retinitis pigmentosa-4, autosomal dominant
182600	Spastic paraplegia-3A
186580	Arthrocutaneous uveitis

190000	Atransferrinemia
192090	Ovarian carcinoma
192090	Breast cancer, lobular
192090	Endometrial carcinoma
192090	Gastric cancer, familial, 137215
203500	Alkaptonuria
231550	Achalasia-addisonianism-alacrimia syndrome
232050	Propionicacidemia, type II or pccB type
245200	Krabbe disease
245900	Norum disease
245900	Fish-eye disease
250100	Metachromatic leukodystrophy
250800	Methemoglobinemia, type I
250800	Methemoglobinemia, type II
251600	Microphthalmia, autosomal recessive
261640	Phenylketonuria due to PTS deficiency
264800	Pseudoxanthoma elasticum
266600	Inflammatory bowel disease-1
270100	Situs inversus viscerum
276600	Tyrosinemia, type II
276900	Usher syndrome, type 1A
276902	Usher syndrome, type 3
278760	Xeroderma pigmentosum, group F
300047	Mental retardation, X-linked 20
300062	Mental retardation, X-linked 14
300071	Night blindness, congenital stationary, type 2
300110	Night blindness, congenital stationary, X-linked incomplete, 300071
300600	Ocular albinism, Forsius-Eriksson type
301000	Thrombocytopenia, X-linked, 313900
301000	Wiskott-Aldrich syndrome
301830	Arthrogryposis, X-linked (spinal muscular atrophy, infantile, X-linked)
309470	Mental retardation, X-linked, syndromic-3, with spastic diplegia
309500	Renpenning syndrome-1
309610	Mental retardation, X-linked, syndromic-2, with dysmorphism and cerebral atrophy
309850	Brunner syndrome
310500	Night blindness, congenital stationary, type 1
310600	Norrie disease
310600	Exudative vitreoretinopathy, X-linked, 305390
311050	Optic atrophy, X-linked
312060	Properdin deficiency, X-linked
600194	Ichthyosis bullosa of Siemens, 146800
600223	Spinocerebellar ataxia-4
600231	Palmoplantar keratoderma, Bothnia type
600536	Myopathy, congenital
600760	Pseudohypoaldosteronism, type I, 264350

600760	Liddle syndrome, 177200
600761	Pseudohypoaldosteronism, type I, 264350
600761	Liddle syndrome, 177200
600808	Enuresis, nocturnal, 2
600882	Charcot-Marie-Tooth neuropathy-2B
600956	Persistent Mullerian duct syndrome, type II, 261550
601199	Neonatal hyperparathyroidism, 239200
601199	Hypocalcemia, autosomal dominant, 601198
601199	Hypocalciuric hypercalcemia, type I, 145980
601284	Hereditary hemorrhagic telangiectasia-2, 600376
601316	Deafness, autosomal dominant 10
601471	Moebius syndrome-2
601666	Insulin-dependent diabetes mellitus-15
601682	Glaucoma 1C, primary open angle
601757	Rhizomelic chondrodysplasia punctata, type 1, 215100
601769	Osteoporosis, involutional
601769	Rickets, vitamin D-resistant, 277440
601928	Monilethrix, 158000
602066	Convulsions, infantile and paroxysmal choreoathetosis
602091	Marfan syndrome, atypical
602116	Glioma
602136	Refsum disease, infantile, 266510
602136	Zellweger syndrome-1, 214100
602136	Adrenoleukodystrophy, neonatal, 202370
602153	Monilethrix, 158000
602447	Coronary artery disease, susceptibility to
602574	Deafness, autosomal dominant 12, 601842
602574	Deafness, autosomal dominant 8, 601543
602772	Retinitis pigmentosa-24

Polynucleotide and Polypeptide Variants

[82] The present invention is directed to variants of the polynucleotide sequence disclosed in SEQ ID NO:X or the complementary strand thereto, nucleotide sequences encoding the polypeptide of SEQ ID NO:Y, the nucleotide sequence of SEQ ID NO:X encoding the polypeptide sequence as defined in column 7 of Table 1A, nucleotide sequences encoding the polypeptide as defined in column 7 of Table 1A, the nucleotide sequence as defined in columns 8 and 9 of Table 2, nucleotide sequences encoding the polypeptide encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2, the nucleotide sequence as defined in column 6 of Table 1B, nucleotide sequences encoding the polypeptide encoded by the nucleotide sequence as defined in column 6 of Table 1B, the

cDNA sequence contained in Clone ID NO:Z, and/or nucleotide sequences encoding the polypeptide encoded by the cDNA sequence contained in Clone ID NO:Z.

[83] The present invention also encompasses variants of the polypeptide sequence disclosed in SEQ ID NO:Y, the polypeptide sequence as defined in column 7 of Table 1A, a polypeptide sequence encoded by the polynucleotide sequence in SEQ ID NO:X, a polypeptide sequence encoded by the nucleotide sequence as defined in columns 8 and 9 of Table 2, a polypeptide sequence encoded by the nucleotide sequence as defined in column 6 of Table 1B, a polypeptide sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X, and/or a polypeptide sequence encoded by the cDNA sequence contained in Clone ID NO:Z.

[84] "Variant" refers to a polynucleotide or polypeptide differing from the polynucleotide or polypeptide of the present invention, but retaining essential properties thereof. Generally, variants are overall closely similar, and, in many regions, identical to the polynucleotide or polypeptide of the present invention.

[85] Thus, one aspect of the invention provides an isolated nucleic acid molecule comprising, or alternatively consisting of, a polynucleotide having a nucleotide sequence selected from the group consisting of: (a) a nucleotide sequence described in SEQ ID NO:X or contained in the cDNA sequence of Clone ID NO:Z; (b) a nucleotide sequence in SEQ ID NO:X or the cDNA in Clone ID NO:Z which encodes the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z; (c) a nucleotide sequence in SEQ ID NO:X or the cDNA in Clone ID NO:Z which encodes a mature polypeptide; (d) a nucleotide sequence in SEQ ID NO:X or the cDNA sequence of Clone ID NO:Z, which encodes a biologically active fragment of a polypeptide; (e) a nucleotide sequence in SEQ ID NO:X or the cDNA sequence of Clone ID NO:Z, which encodes an antigenic fragment of a polypeptide; (f) a nucleotide sequence encoding a polypeptide comprising the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z; (g) a nucleotide sequence encoding a mature polypeptide of the amino acid sequence of SEQ ID NO:Y or the amino acid sequence encoded by the cDNA in Clone ID NO:Z; (h) a nucleotide sequence encoding a biologically active fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z; (i) a nucleotide sequence encoding an antigenic fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete

amino acid sequence encoded by the cDNA in Clone ID NO:Z; and (j) a nucleotide sequence complementary to any of the nucleotide sequences in (a), (b), (c), (d), (e), (f), (g), (h), or (i) above.

[86] The present invention is also directed to nucleic acid molecules which comprise, or alternatively consist of, a nucleotide sequence which is at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100%, identical to, for example, any of the nucleotide sequences in (a), (b), (c), (d), (e), (f), (g), (h), (i), or (j) above, the nucleotide coding sequence in SEQ ID NO:X or the complementary strand thereto, the nucleotide coding sequence of the cDNA contained in Clone ID NO:Z or the complementary strand thereto, a nucleotide sequence encoding the polypeptide of SEQ ID NO:Y, a nucleotide sequence encoding a polypeptide sequence encoded by the nucleotide sequence in SEQ ID NO:X, a polypeptide sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X, a nucleotide sequence encoding the polypeptide encoded by the cDNA contained in Clone ID NO:Z, the nucleotide coding sequence in SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto, a nucleotide sequence encoding the polypeptide encoded by the nucleotide sequence in SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto, the nucleotide coding sequence in SEQ ID NO:B as defined in column 6 of Table 1B or the complementary strand thereto, a nucleotide sequence encoding the polypeptide encoded by the nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B or the complementary strand thereto, the nucleotide sequence in SEQ ID NO:X encoding the polypeptide sequence as defined in column 7 of Table 1A or the complementary strand thereto, nucleotide sequences encoding the polypeptide as defined in column 7 of Table 1A or the complementary strand thereto, and/or polynucleotide fragments of any of these nucleic acid molecules (e.g., those fragments described herein). Polynucleotides which hybridize to the complement of these nucleic acid molecules under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention, as are polypeptides encoded by these polynucleotides and nucleic acids.

[87] In a preferred embodiment, the invention encompasses nucleic acid molecules which comprise, or alternatively, consist of a polynucleotide which hybridizes under stringent hybridization conditions, or alternatively, under lower stringency conditions, to a polynucleotide in (a), (b), (c), (d), (e), (f), (g), (h), or (i), above, as are polypeptides encoded by these polynucleotides. In another preferred embodiment, polynucleotides which

hybridize to the complement of these nucleic acid molecules under stringent hybridization conditions, or alternatively, under lower stringency conditions, are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

[88] In another embodiment, the invention provides a purified protein comprising, or alternatively consisting of, a polypeptide having an amino acid sequence selected from the group consisting of: (a) the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z; (b) the amino acid sequence of a mature form of a polypeptide having the amino acid sequence of SEQ ID NO:Y or the amino acid sequence encoded by the cDNA in Clone ID NO:Z; (c) the amino acid sequence of a biologically active fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z; and (d) the amino acid sequence of an antigenic fragment of a polypeptide having the complete amino acid sequence of SEQ ID NO:Y or the complete amino acid sequence encoded by the cDNA in Clone ID NO:Z.

[89] The present invention is also directed to proteins which comprise, or alternatively consist of, an amino acid sequence which is at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100%, identical to, for example, any of the amino acid sequences in (a), (b), (c), or (d), above, the amino acid sequence shown in SEQ ID NO:Y, the amino acid sequence encoded by the cDNA contained in Clone ID NO:Z, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:X as defined in columns 8 and 9 of Table 2, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B, the amino acid sequence as defined in column 7 of Table 1A, an amino acid sequence encoded by the nucleotide sequence in SEQ ID NO:X, and an amino acid sequence encoded by the complement of the polynucleotide sequence in SEQ ID NO:X. Fragments of these polypeptides are also provided (e.g., those fragments described herein). Further proteins encoded by polynucleotides which hybridize to the complement of the nucleic acid molecules encoding these amino acid sequences under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention, as are the polynucleotides encoding these proteins.

[90] By a nucleic acid having a nucleotide sequence at least, for example, 95% "identical" to a reference nucleotide sequence of the present invention, it is intended that the nucleotide sequence of the nucleic acid is identical to the reference sequence except that the

nucleotide sequence may include up to five point mutations per each 100 nucleotides of the reference nucleotide sequence encoding the polypeptide. In other words, to obtain a nucleic acid having a nucleotide sequence at least 95% identical to a reference nucleotide sequence, up to 5% of the nucleotides in the reference sequence may be deleted or substituted with another nucleotide, or a number of nucleotides up to 5% of the total nucleotides in the reference sequence may be inserted into the reference sequence. The query sequence may be an entire sequence referred to in Table 1A or 2 as the ORF (open reading frame), or any fragment specified as described herein.

[91] As a practical matter, whether any particular nucleic acid molecule or polypeptide is at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to a nucleotide sequence of the present invention can be determined conventionally using known computer programs. A preferred method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci. 6:237-245 (1990)). In a sequence alignment the query and subject sequences are both DNA sequences. An RNA sequence can be compared by converting U's to T's. The result of said global sequence alignment is expressed as percent identity. Preferred parameters used in a FASTDB alignment of DNA sequences to calculate percent identity are: Matrix=Unitary, k-tuple=4, Mismatch Penalty=1, Joining Penalty=30, Randomization Group Length=0, Cutoff Score=1, Gap Penalty=5, Gap Size Penalty 0.05, Window Size=500 or the length of the subject nucleotide sequence, whichever is shorter.

[92] If the subject sequence is shorter than the query sequence because of 5' or 3' deletions, not because of internal deletions, a manual correction must be made to the results. This is because the FASTDB program does not account for 5' and 3' truncations of the subject sequence when calculating percent identity. For subject sequences truncated at the 5' or 3' ends, relative to the query sequence, the percent identity is corrected by calculating the number of bases of the query sequence that are 5' and 3' of the subject sequence, which are not matched/aligned, as a percent of the total bases of the query sequence. Whether a nucleotide is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This corrected score is what is used for the purposes of the present invention. Only bases

outside the 5' and 3' bases of the subject sequence, as displayed by the FASTDB alignment, which are not matched/aligned with the query sequence, are calculated for the purposes of manually adjusting the percent identity score.

[93] For example, a 90 base subject sequence is aligned to a 100 base query sequence to determine percent identity. The deletions occur at the 5' end of the subject sequence and therefore, the FASTDB alignment does not show a matched/alignment of the first 10 bases at 5' end. The 10 unpaired bases represent 10% of the sequence (number of bases at the 5' and 3' ends not matched/total number of bases in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 bases were perfectly matched the final percent identity would be 90%. In another example, a 90 base subject sequence is compared with a 100 base query sequence. This time the deletions are internal deletions so that there are no bases on the 5' or 3' of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only bases 5' and 3' of the subject sequence which are not matched/aligned with the query sequence are manually corrected for. No other manual corrections are to be made for the purposes of the present invention.

[94] By a polypeptide having an amino acid sequence at least, for example, 95% "identical" to a query amino acid sequence of the present invention, it is intended that the amino acid sequence of the subject polypeptide is identical to the query sequence except that the subject polypeptide sequence may include up to five amino acid alterations per each 100 amino acids of the query amino acid sequence. In other words, to obtain a polypeptide having an amino acid sequence at least 95% identical to a query amino acid sequence, up to 5% of the amino acid residues in the subject sequence may be inserted, deleted, (indels) or substituted with another amino acid. These alterations of the reference sequence may occur at the amino or carboxy terminal positions of the reference amino acid sequence or anywhere between those terminal positions, interspersed either individually among residues in the reference sequence or in one or more contiguous groups within the reference sequence.

[95] As a practical matter, whether any particular polypeptide is at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to, for instance, the amino acid sequence of a polypeptide referred to in Table 1A (e.g., the amino acid sequence identified in column 6) or Table 2 (e.g., the amino acid sequence of the polypeptide encoded by the polynucleotide

sequence defined in columns 8 and 9 of Table 2) or a fragment thereof, the amino acid sequence of the polypeptide encoded by the polynucleotide sequence in SEQ ID NO:B as defined in column 6 of Table 1B or a fragment thereof, the amino acid sequence of the polypeptide encoded by the nucleotide sequence in SEQ ID NO:X or a fragment thereof, or the amino acid sequence of the polypeptide encoded by cDNA contained in Clone ID NO:Z, or a fragment thereof, can be determined conventionally using known computer programs. A preferred method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci.6:237-245 (1990)). In a sequence alignment the query and subject sequences are either both nucleotide sequences or both amino acid sequences. The result of said global sequence alignment is expressed as percent identity. Preferred parameters used in a FASTDB amino acid alignment are: Matrix=PAM 0, k-tuple=2, Mismatch Penalty=1, Joining Penalty=20, Randomization Group Length=0, Cutoff Score=1, Window Size=sequence length, Gap Penalty=5, Gap Size Penalty=0.05, Window Size=500 or the length of the subject amino acid sequence, whichever is shorter.

[96] If the subject sequence is shorter than the query sequence due to N- or C-terminal deletions, not because of internal deletions, a manual correction must be made to the results. This is because the FASTDB program does not account for N- and C-terminal truncations of the subject sequence when calculating global percent identity. For subject sequences truncated at the N- and C-termini, relative to the query sequence, the percent identity is corrected by calculating the number of residues of the query sequence that are N- and C-terminal of the subject sequence, which are not matched/aligned with a corresponding subject residue, as a percent of the total bases of the query sequence. Whether a residue is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This final percent identity score is what is used for the purposes of the present invention. Only residues to the N- and C-termini of the subject sequence, which are not matched/aligned with the query sequence, are considered for the purposes of manually adjusting the percent identity score. That is, only query residue positions outside the farthest N- and C- terminal residues of the subject sequence.

[97] For example, a 90 amino acid residue subject sequence is aligned with a 100

residue query sequence to determine percent identity. The deletion occurs at the N-terminus of the subject sequence and therefore, the FASTDB alignment does not show a matching/alignment of the first 10 residues at the N-terminus. The 10 unpaired residues represent 10% of the sequence (number of residues at the N- and C- termini not matched/total number of residues in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 residues were perfectly matched the final percent identity would be 90%. In another example, a 90 residue subject sequence is compared with a 100 residue query sequence. This time the deletions are internal deletions so there are no residues at the N- or C-termini of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only residue positions outside the N- and C-terminal ends of the subject sequence, as displayed in the FASTDB alignment, which are not matched/aligned with the query sequence are manually corrected for. No other manual corrections are to be made for the purposes of the present invention.

[98] The polynucleotide variants of the invention may contain alterations in the coding regions, non-coding regions, or both. Especially preferred are polynucleotide variants containing alterations which produce silent substitutions, additions, or deletions, but do not alter the properties or activities of the encoded polypeptide. Nucleotide variants produced by silent substitutions due to the degeneracy of the genetic code are preferred. Moreover, polypeptide variants in which less than 50, less than 40, less than 30, less than 20, less than 10, or 5-50, 5-25, 5-10, 1-5, or 1-2 amino acids are substituted, deleted, or added in any combination are also preferred. Polynucleotide variants can be produced for a variety of reasons, e.g., to optimize codon expression for a particular host (change codons in the human mRNA to those preferred by a bacterial host such as *E. coli*).

[99] Naturally occurring variants are called "allelic variants," and refer to one of several alternate forms of a gene occupying a given locus on a chromosome of an organism. (Genes II, Lewin, B., ed., John Wiley & Sons, New York (1985)). These allelic variants can vary at either the polynucleotide and/or polypeptide level and are included in the present invention. Alternatively, non-naturally occurring variants may be produced by mutagenesis techniques or by direct synthesis.

[100] Using known methods of protein engineering and recombinant DNA technology, variants may be generated to improve or alter the characteristics of the polypeptides of the present invention. For instance, one or more amino acids can be deleted from the N-

terminus or C-terminus of the polypeptide of the present invention without substantial loss of biological function. As an example, Ron et al. (J. Biol. Chem. 268: 2984-2988 (1993)) reported variant KGF proteins having heparin binding activity even after deleting 3, 8, or 27 amino-terminal amino acid residues. Similarly, Interferon gamma exhibited up to ten times higher activity after deleting 8-10 amino acid residues from the carboxy terminus of this protein. (Dobeli et al., J. Biotechnology 7:199-216 (1988).)

[101] Moreover, ample evidence demonstrates that variants often retain a biological activity similar to that of the naturally occurring protein. For example, Gayle and coworkers (J. Biol. Chem. 268:22105-22111 (1993)) conducted extensive mutational analysis of human cytokine IL-1a. They used random mutagenesis to generate over 3,500 individual IL-1a mutants that averaged 2.5 amino acid changes per variant over the entire length of the molecule. Multiple mutations were examined at every possible amino acid position. The investigators found that "[m]ost of the molecule could be altered with little effect on either [binding or biological activity]." In fact, only 23 unique amino acid sequences, out of more than 3,500 nucleotide sequences examined, produced a protein that significantly differed in activity from wild-type.

[102] Furthermore, even if deleting one or more amino acids from the N-terminus or C-terminus of a polypeptide results in modification or loss of one or more biological functions, other biological activities may still be retained. For example, the ability of a deletion variant to induce and/or to bind antibodies which recognize the secreted form will likely be retained when less than the majority of the residues of the secreted form are removed from the N-terminus or C-terminus. Whether a particular polypeptide lacking N- or C-terminal residues of a protein retains such immunogenic activities can readily be determined by routine methods described herein and otherwise known in the art.

[103] Thus, the invention further includes polypeptide variants which show a functional activity (e.g., biological activity) of the polypeptides of the invention. Such variants include deletions, insertions, inversions, repeats, and substitutions selected according to general rules known in the art so as have little effect on activity.

[104] The present application is directed to nucleic acid molecules at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100% identical to the nucleic acid sequences disclosed herein, (e.g., encoding a polypeptide having the amino acid sequence of an N and/or C terminal deletion), irrespective of whether they encode a polypeptide having functional activity. This is because even where a particular nucleic acid molecule does not encode a

polypeptide having functional activity, one of skill in the art would still know how to use the nucleic acid molecule, for instance, as a hybridization probe or a polymerase chain reaction (PCR) primer. Uses of the nucleic acid molecules of the present invention that do not encode a polypeptide having functional activity include, inter alia, (1) isolating a gene or allelic or splice variants thereof in a cDNA library; (2) *in situ* hybridization (e.g., "FISH") to metaphase chromosomal spreads to provide precise chromosomal location of the gene, as described in Verma et al., *Human Chromosomes: A Manual of Basic Techniques*, Pergamon Press, New York (1988); (3) Northern Blot analysis for detecting mRNA expression in specific tissues (e.g., normal or diseased tissues); and (4) *in situ* hybridization (e.g., histochemistry) for detecting mRNA expression in specific tissues (e.g., normal or diseased tissues).

[105] Preferred, however, are nucleic acid molecules having sequences at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% or 100% identical to the nucleic acid sequences disclosed herein, which do, in fact, encode a polypeptide having functional activity. By a polypeptide having "functional activity" is meant, a polypeptide capable of displaying one or more known functional activities associated with a full-length (complete) protein of the invention. Such functional activities include, but are not limited to, biological activity, antigenicity [ability to bind (or compete with a polypeptide of the invention for binding) to an anti-polypeptide of the invention antibody], immunogenicity (ability to generate antibody which binds to a specific polypeptide of the invention), ability to form multimers with polypeptides of the invention, and ability to bind to a receptor or ligand for a polypeptide of the invention.

[106] The functional activity of the polypeptides, and fragments, variants and derivatives of the invention, can be assayed by various methods.

[107] For example, in one embodiment where one is assaying for the ability to bind or compete with a full-length polypeptide of the present invention for binding to an anti-polypeptide antibody, various immunoassays known in the art can be used, including but not limited to, competitive and non-competitive assay systems using techniques such as radioimmunoassays, ELISA (enzyme linked immunosorbent assay), "sandwich" immunoassays, immunoradiometric assays, gel diffusion precipitation reactions, immunodiffusion assays, *in situ* immunoassays (using colloidal gold, enzyme or radioisotope labels, for example), western blots, precipitation reactions, agglutination assays (e.g., gel agglutination assays, hemagglutination assays), complement fixation

assays, immunofluorescence assays, protein A assays, and immunoelectrophoresis assays, etc. In one embodiment, antibody binding is detected by detecting a label on the primary antibody. In another embodiment, the primary antibody is detected by detecting binding of a secondary antibody or reagent to the primary antibody. In a further embodiment, the secondary antibody is labeled. Many means are known in the art for detecting binding in an immunoassay and are within the scope of the present invention.

[108] In another embodiment, where a ligand is identified, or the ability of a polypeptide fragment, variant or derivative of the invention to multimerize is being evaluated, binding can be assayed, e.g., by means well-known in the art, such as, for example, reducing and non-reducing gel chromatography, protein affinity chromatography, and affinity blotting. See generally, Phizicky et al., *Microbiol. Rev.* 59:94-123 (1995). In another embodiment, the ability of physiological correlates of a polypeptide of the present invention to bind to a substrate(s) of the polypeptide of the invention can be routinely assayed using techniques known in the art.

[109] In addition, assays described herein (see Examples) and otherwise known in the art may routinely be applied to measure the ability of polypeptides of the present invention and fragments, variants and derivatives thereof to elicit polypeptide related biological activity (either *in vitro* or *in vivo*). Other methods will be known to the skilled artisan and are within the scope of the invention.

[110] Of course, due to the degeneracy of the genetic code, one of ordinary skill in the art will immediately recognize that a large number of the nucleic acid molecules having a sequence at least 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% identical to, for example, the nucleic acid sequence of the cDNA contained in Clone ID NO:Z, the nucleic acid sequence referred to in Table 1A (SEQ ID NO:X), the nucleic acid sequence disclosed in Table 2 (e.g., the nucleic acid sequence delineated in columns 8 and 9) or fragments thereof, will encode polypeptides "having functional activity." In fact, since degenerate variants of any of these nucleotide sequences all encode the same polypeptide, in many instances, this will be clear to the skilled artisan even without performing the above described comparison assay. It will be further recognized in the art that, for such nucleic acid molecules that are not degenerate variants, a reasonable number will also encode a polypeptide having functional activity. This is because the skilled artisan is fully aware of amino acid substitutions that are either less likely or not likely to significantly effect protein function (e.g., replacing one aliphatic amino acid with a second aliphatic amino acid), as

further described below.

[111] For example, guidance concerning how to make phenotypically silent amino acid substitutions is provided in Bowie et al., "Deciphering the Message in Protein Sequences: Tolerance to Amino Acid Substitutions," *Science* 247:1306-1310 (1990), wherein the authors indicate that there are two main strategies for studying the tolerance of an amino acid sequence to change.

[112] The first strategy exploits the tolerance of amino acid substitutions by natural selection during the process of evolution. By comparing amino acid sequences in different species, conserved amino acids can be identified. These conserved amino acids are likely important for protein function. In contrast, the amino acid positions where substitutions have been tolerated by natural selection indicates that these positions are not critical for protein function. Thus, positions tolerating amino acid substitution could be modified while still maintaining biological activity of the protein.

[113] The second strategy uses genetic engineering to introduce amino acid changes at specific positions of a cloned gene to identify regions critical for protein function. For example, site directed mutagenesis or alanine-scanning mutagenesis (introduction of single alanine mutations at every residue in the molecule) can be used. See Cunningham and Wells, *Science* 244:1081-1085 (1989). The resulting mutant molecules can then be tested for biological activity.

[114] As the authors state, these two strategies have revealed that proteins are surprisingly tolerant of amino acid substitutions. The authors further indicate which amino acid changes are likely to be permissive at certain amino acid positions in the protein. For example, most buried (within the tertiary structure of the protein) amino acid residues require nonpolar side chains, whereas few features of surface side chains are generally conserved. Moreover, tolerated conservative amino acid substitutions involve replacement of the aliphatic or hydrophobic amino acids Ala, Val, Leu and Ile; replacement of the hydroxyl residues Ser and Thr; replacement of the acidic residues Asp and Glu; replacement of the amide residues Asn and Gln, replacement of the basic residues Lys, Arg, and His; replacement of the aromatic residues Phe, Tyr, and Trp, and replacement of the small-sized amino acids Ala, Ser, Thr, Met, and Gly. Besides conservative amino acid substitution, variants of the present invention include (i) substitutions with one or more of the non-conserved amino acid residues, where the substituted amino acid residues may or may not be one encoded by the genetic code, or (ii) substitutions with one or more of the

amino acid residues having a substituent group, or (iii) fusion of the mature polypeptide with another compound, such as a compound to increase the stability and/or solubility of the polypeptide (for example, polyethylene glycol), (iv) fusion of the polypeptide with additional amino acids, such as, for example, an IgG Fc fusion region peptide, serum albumin (preferably human serum albumin) or a fragment thereof, or leader or secretory sequence, or a sequence facilitating purification, or (v) fusion of the polypeptide with another compound, such as albumin (including but not limited to recombinant albumin (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998, herein incorporated by reference in their entirety)). Such variant polypeptides are deemed to be within the scope of those skilled in the art from the teachings herein.

[115] For example, polypeptide variants containing amino acid substitutions of charged amino acids with other charged or neutral amino acids may produce proteins with improved characteristics, such as less aggregation. Aggregation of pharmaceutical formulations both reduces activity and increases clearance due to the aggregate's immunogenic activity. See Pinckard et al., Clin. Exp. Immunol. 2:331-340 (1967); Robbins et al., Diabetes 36: 838-845 (1987); Cleland et al., Crit. Rev. Therapeutic Drug Carrier Systems 10:307-377 (1993).

[116] A further embodiment of the invention relates to polypeptides which comprise the amino acid sequence of a polypeptide having an amino acid sequence which contains at least one amino acid substitution, but not more than 50 amino acid substitutions, even more preferably, not more than 40 amino acid substitutions, still more preferably, not more than 30 amino acid substitutions, and still even more preferably, not more than 20 amino acid substitutions from a polypeptide sequence disclosed herein. Of course it is highly preferable for a polypeptide to have an amino acid sequence which comprises the amino acid sequence of a polypeptide of SEQ ID NO:Y, an amino acid sequence encoded by SEQ ID NO:X, an amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, an amino acid sequence encoded by the complement of SEQ ID NO:X, and/or an amino acid sequence encoded by cDNA contained in Clone ID NO:Z which contains, in order of ever-increasing preference, at least one, but not more than 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 amino acid substitutions.

[117] In specific embodiments, the polypeptides of the invention comprise, or alternatively, consist of, fragments or variants of a reference amino acid sequence selected from: (a) the amino acid sequence of SEQ ID NO:Y or fragments thereof (e.g., the mature

form and/or other fragments described herein); (b) the amino acid sequence encoded by SEQ ID NO:X or fragments thereof; (c) the amino acid sequence encoded by the complement of SEQ ID NO:X or fragments thereof; (d) the amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or fragments thereof; and (e) the amino acid sequence encoded by cDNA contained in Clone ID NO:Z or fragments thereof; wherein the fragments or variants have 1-5, 5-10, 5-25, 5-50, 10-50 or 50-150, amino acid residue additions, substitutions, and/or deletions when compared to the reference amino acid sequence. In preferred embodiments, the amino acid substitutions are conservative. Polynucleotides encoding these polypeptides are also encompassed by the invention.

Polynucleotide and Polypeptide Fragments

[118] The present invention is also directed to polynucleotide fragments of the polynucleotides (nucleic acids) of the invention. In the present invention, a "polynucleotide fragment" refers to a polynucleotide having a nucleic acid sequence which, for example: is a portion of the cDNA contained in Clone ID NO:Z or the complementary strand thereto; is a portion of the polynucleotide sequence encoding the polypeptide encoded by the cDNA contained in Clone ID NO:Z or the complementary strand thereto; is a portion of a polynucleotide sequence encoding the amino acid sequence encoded by the region of SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto; is a portion of the polynucleotide sequence of SEQ ID NO:X as defined in columns 8 and 9 of Table 2 or the complementary strand thereto; is a portion of the polynucleotide sequence in SEQ ID NO:X or the complementary strand thereto; is a polynucleotide sequence encoding a portion of the polypeptide of SEQ ID NO:Y; is a polynucleotide sequence encoding a portion of a polypeptide encoded by SEQ ID NO:X; is a polynucleotide sequence encoding a portion of a polypeptide encoded by the complement of the polynucleotide sequence in SEQ ID NO:X; is a portion of a polynucleotide sequence encoding the amino acid sequence encoded by the region of SEQ ID NO:B as defined in column 6 of Table 1B or the complementary strand thereto; or is a portion of the polynucleotide sequence of SEQ ID NO:B as defined in column 6 of Table 1B or the complementary strand thereto.

[119] The polynucleotide fragments of the invention are preferably at least about 15 nt, and more preferably at least about 20 nt, still more preferably at least about 30 nt, and even more preferably, at least about 40 nt, at least about 50 nt, at least about 75 nt, or at least

about 150 nt in length. A fragment "at least 20 nt in length," for example, is intended to include 20 or more contiguous bases from the cDNA sequence contained in Clone ID NO:Z, or the nucleotide sequence shown in SEQ ID NO:X or the complementary strand thereto. In this context "about" includes the particularly recited value or a value larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. These nucleotide fragments have uses that include, but are not limited to, as diagnostic probes and primers as discussed herein. Of course, larger fragments (e.g., at least 160, 170, 180, 190, 200, 250, 500, 600, 1000, or 2000 nucleotides in length) are also encompassed by the invention.

[120] Moreover, representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a sequence from about nucleotide number 1-50, 51-100, 101-150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500, 501-550, 551-600, 601-650, 651-700, 701-750, 751-800, 801-850, 851-900, 901-950, 951-1000, 1001-1050, 1051-1100, 1101-1150, 1151-1200, 1201-1250, 1251-1300, 1301-1350, 1351-1400, 1401-1450, 1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900, 1901-1950, 1951-2000, 2001-2050, 2051-2100, 2101-2150, 2151-2200, 2201-2250, 2251-2300, 2301-2350, 2351-2400, 2401-2450, 2451-2500, 2501-2550, 2551-2600, 2601-2650, 2651-2700, 2701-2750, 2751-2800, 2801-2850, 2851-2900, 2901-2950, 2951-3000, 3001-3050, 3051-3100, 3101-3150, 3151-3200, 3201-3250, 3251-3300, 3301-3350, 3351-3400, 3401-3450, 3451-3500, 3501-3550, 3551-3600, 3601-3650, 3651-3700, 3701-3750, 3751-3800, 3801-3850, 3851-3900, 3901-3950, 3951-4000, 4001-4050, 4051-4100, 4101-4150, 4151-4200, 4201-4250, 4251-4300, 4301-4350, 4351-4400, 4401-4450, 4451-4500, 4501-4550, 4551-4600, 4601-4650, 4651-4700, 4701-4750, 4751-4800, 4801-4850, 4851-4900, 4901-4950, 4951-5000, 5001-5050, 5051-5100, 5101-5150, 5151-5200, 5201-5250, 5251-5300, 5301-5350, 5351-5400, 5401-5450, 5451-5500, 5501-5550, 5551-5600, 5601-5650, 5651-5700, 5701-5750, 5751-5800, 5801-5850, 5851-5900, 5901-5950, 5951-6000, 6001-6050, 6051-6100, 6101-6150, 6151-6200, 6201-6250, 6251-6300, 6301-6350, 6351-6400, 6401-6450, 6451-6500, 6501-6550, 6551-6600, 6601-6650, 6651-6700, 6701-6750, 6751-6800, 6801-6850, 6851-6900, 6901-6950, 6951-7000, 7001-7050, 7051-7100, 7101-7150, 7151-7200, 7201-7250, 7251-7300 or 7301 to the end of SEQ ID NO:X, or the complementary strand thereto. In this context "about" includes the particularly recited range or a range larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. Preferably, these fragments encode a

polypeptide which has a functional activity (e.g., biological activity). More preferably, these polynucleotides can be used as probes or primers as discussed herein. Polynucleotides which hybridize to one or more of these polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

[121] Further representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a sequence from about nucleotide number 1-50, 51-100, 101-150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500, 501-550, 551-600, 601-650, 651-700, 701-750, 751-800, 801-850, 851-900, 901-950, 951-1000, 1001-1050, 1051-1100, 1101-1150, 1151-1200, 1201-1250, 1251-1300, 1301-1350, 1351-1400, 1401-1450, 1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900, 1901-1950, 1951-2000, 2001-2050, 2051-2100, 2101-2150, 2151-2200, 2201-2250, 2251-2300, 2301-2350, 2351-2400, 2401-2450, 2451-2500, 2501-2550, 2551-2600, 2601-2650, 2651-2700, 2701-2750, 2751-2800, 2801-2850, 2851-2900, 2901-2950, 2951-3000, 3001-3050, 3051-3100, 3101-3150, 3151-3200, 3201-3250, 3251-3300, 3301-3350, 3351-3400, 3401-3450, 3451-3500, 3501-3550, 3551-3600, 3601-3650, 3651-3700, 3701-3750, 3751-3800, 3801-3850, 3851-3900, 3901-3950, 3951-4000, 4001-4050, 4051-4100, 4101-4150, 4151-4200, 4201-4250, 4251-4300, 4301-4350, 4351-4400, 4401-4450, 4451-4500, 4501-4550, 4551-4600, 4601-4650, 4651-4700, 4701-4750, 4751-4800, 4801-4850, 4851-4900, 4901-4950, 4951-5000, 5001-5050, 5051-5100, 5101-5150, 5151-5200, 5201-5250, 5251-5300, 5301-5350, 5351-5400, 5401-5450, 5451-5500, 5501-5550, 5551-5600, 5601-5650, 5651-5700, 5701-5750, 5751-5800, 5801-5850, 5851-5900, 5901-5950, 5951-6000, 6001-6050, 6051-6100, 6101-6150, 6151-6200, 6201-6250, 6251-6300, 6301-6350, 6351-6400, 6401-6450, 6451-6500, 6501-6550, 6551-6600, 6601-6650, 6651-6700, 6701-6750, 6751-6800, 6801-6850, 6851-6900, 6901-6950, 6951-7000, 7001-7050, 7051-7100, 7101-7150, 7151-7200, 7201-7250, 7251-7300 or 7301 to the end of the cDNA sequence contained in Clone ID NO:Z, or the complementary strand thereto. In this context "about" includes the particularly recited range or a range larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. Preferably, these fragments encode a polypeptide which has a functional activity (e.g., biological activity). More preferably, these polynucleotides can be used as probes or primers as discussed herein. Polynucleotides which hybridize to one or more of these polynucleotides under

stringent hybridization conditions or alternatively, under lower stringency conditions are also encompassed by the invention, as are polypeptides encoded by these polynucleotides.

[122] Moreover, representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a nucleic acid sequence comprising one, two, three, four, five, six, seven, eight, nine, ten, or more of the above described polynucleotide fragments of the invention in combination with a polynucleotide sequence delineated in Table 1B column 6. Additional, representative examples of polynucleotide fragments of the invention comprise, or alternatively consist of, a nucleic acid sequence comprising one, two, three, four, five, six, seven, eight, nine, ten, or more of the above described polynucleotide fragments of the invention in combination with a polynucleotide sequence that is the complementary strand of a sequence delineated in column 6 of Table 1B. In further embodiments, the above-described polynucleotide fragments of the invention comprise, or alternatively consist of, sequences delineated in Table 1B, column 6, and have a nucleic acid sequence which is different from that of the BAC fragment having the sequence disclosed in SEQ ID NO:B (see Table 1B, column 5). In additional embodiments, the above-described polynucleotide fragments of the invention comprise, or alternatively consist of, sequences delineated in Table 1B, column 6, and have a nucleic acid sequence which is different from that published for the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). In additional embodiments, the above-described polynucleotides of the invention comprise, or alternatively consist of, sequences delineated Table 1B, column 6, and have a nucleic acid sequence which is different from that contained in the BAC clone identified as BAC ID NO:A (see Table 1B, column 4). Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides and polypeptides are also encompassed by the invention.

[123] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in column 6 of Table 1B, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1B, column 2) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[124] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in column 6 of Table 1B which correspond to the same Clone ID NO:Z (see Table 1B, column 1), and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A or 1B) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[125] In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of, one, two, three, four, five, six, seven, eight, nine, ten, or more fragments of the sequences delineated in the same row of column 6 of Table 1B, and the polynucleotide sequence of SEQ ID NO:X (e.g., as defined in Table 1A or 1B) or fragments or variants thereof. Polypeptides encoded by these polynucleotides, other polynucleotides that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention.

[126] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of the sequence of SEQ ID NO:X are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids that encode these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[127] In additional specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X (e.g., as described herein) are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by

these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[128] In further specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of a fragment or variant of the sequence of SEQ ID NO:X and the 5' 10 polynucleotides of the sequence of one of the sequences delineated in column 6 of Table 1B are directly contiguous. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[129] In specific embodiments, polynucleotides of the invention comprise, or alternatively consist of a polynucleotide sequence in which the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B and the 5' 10 polynucleotides of another sequence in column 6 are directly contiguous. In preferred embodiments, the 3' 10 polynucleotides of one of the sequences delineated in column 6 of Table 1B is directly contiguous with the 5' 10 polynucleotides of the next sequential exon delineated in Table 1B, column 6. Nucleic acids which hybridize to the complement of these 20 contiguous polynucleotides under stringent hybridization conditions or alternatively, under lower stringency conditions, are also encompassed by the invention. Polypeptides encoded by these polynucleotides and/or nucleic acids, other polynucleotides and/or nucleic acids encoding these polypeptides, and antibodies that bind these polypeptides are also encompassed by the invention. Additionally, fragments and variants of the above-described polynucleotides, nucleic acids, and polypeptides are also encompassed by the invention.

[130] In the present invention, a "polypeptide fragment" refers to an amino acid sequence which is a portion of that contained in SEQ ID NO:Y, a portion of an amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, a portion of an amino acid sequence encoded by the polynucleotide sequence of SEQ ID NO:X, a portion of an amino acid sequence encoded by the complement of the

polynucleotide sequence in SEQ ID NO:X, and/or a portion of an amino acid sequence encoded by the cDNA contained in Clone ID NO:Z. Protein (polypeptide) fragments may be "free-standing," or comprised within a larger polypeptide of which the fragment forms a part or region, most preferably as a single continuous region. Representative examples of polypeptide fragments of the invention; include, for example, fragments comprising, or alternatively consisting of, from about amino acid number 1-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-160, 161-180, 181-200, 201-220, 221-240, 241-260, 261-280, 281-300, 301-320, 321-340, 341-360, 361-380, 381-400, 401-420, 421-440, 441-460, 461-480, 481-500, 501-520, 521-540, 541-560, 561-580, 581-600, 601-620, 621-640, 641-660, 661-680, 681-700, 701-720, 721-740, 741-760, 761-780, 781-800, 801-820, 821-840, 841-860, 861-880, 881-900, 901-920, 921-940, 941-960, 961-980, 981-1000, 1001-1020, 1021-1040, 1041-1060, 1061-1080, 1081-1100, 1101-1120, 1121-1140, 1141-1160, 1161-1180, 1181-1200, 1201-1220, 1221-1240, 1241-1260, 1261-1280, 1281-1300, 1301-1320, 1321-1340, 1341-1360, 1361-1380, 1381-1400, 1401-1420, 1421-1440, or 1441 to the end of the coding region of cDNA and SEQ ID NO: Y. In a preferred embodiment, polypeptide fragments of the invention include, for example, fragments comprising, or alternatively consisting of, from about amino acid number 1-20, 21-40, 41-60, 61-80, 81-100, 101-120, 121-140, 141-160, 161-180, 181-200, 201-220, 221-240, 241-260, 261-280, 281-300, 301-320, 321-340, 341-360, 361-380, 381-400, 401-420, 421-440, 441-460, 461-480, 481-500, 501-520, 521-540, 541-560, 561-580, 581-600, 601-620, 621-640, 641-660, 661-680, 681-700, 701-720, 721-740, 741-760, 761-780, 781-800, 801-820, 821-840, 841-860, 861-880, 881-900, 901-920, 921-940, 941-960, 961-980, 981-1000, 1001-1020, 1021-1040, 1041-1060, 1061-1080, 1081-1100, 1101-1120, 1121-1140, 1141-1160, 1161-1180, 1181-1200, 1201-1220, 1221-1240, 1241-1260, 1261-1280, 1281-1300, 1301-1320, 1321-1340, 1341-1360, 1361-1380, 1381-1400, 1401-1420, 1421-1440, or 1441 to the end of the coding region of SEQ ID NO:Y. Moreover, polypeptide fragments of the invention may be at least about 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 100, 110, 120, 130, 140, or 150 amino acids in length. In this context "about" includes the particularly recited ranges or values, or ranges or values larger or smaller by several (5, 4, 3, 2, or 1) amino acids, at either extreme or at both extremes. Polynucleotides encoding these polypeptide fragments are also encompassed by the invention.

[131] Even if deletion of one or more amino acids from the N-terminus of a protein results in modification of loss of one or more biological functions of the protein, other

functional activities (e.g., biological activities, ability to multimerize, ability to bind a ligand) may still be retained. For example, the ability of shortened muteins to induce and/or bind to antibodies which recognize the complete or mature forms of the polypeptides generally will be retained when less than the majority of the residues of the complete or mature polypeptide are removed from the N-terminus. Whether a particular polypeptide lacking N-terminal residues of a complete polypeptide retains such immunologic activities can readily be determined by routine methods described herein and otherwise known in the art. It is not unlikely that a mutein with a large number of deleted N-terminal amino acid residues may retain some biological or immunogenic activities. In fact, peptides composed of as few as six amino acid residues may often evoke an immune response.

[132] Accordingly, polypeptide fragments include the secreted protein as well as the mature form. Further preferred polypeptide fragments include the secreted protein or the mature form having a continuous series of deleted residues from the amino or the carboxy terminus, or both. For example, any number of amino acids, ranging from 1-60, can be deleted from the amino terminus of either the secreted polypeptide or the mature form. Similarly, any number of amino acids, ranging from 1-30, can be deleted from the carboxy terminus of the secreted protein or mature form. Furthermore, any combination of the above amino and carboxy terminus deletions are preferred. Similarly, polynucleotides encoding these polypeptide fragments are also preferred.

[133] The present invention further provides polypeptides having one or more residues deleted from the amino terminus of the amino acid sequence of a polypeptide disclosed herein (e.g., a polypeptide of SEQ ID NO:Y, a polypeptide encoded by the polynucleotide sequence contained in SEQ ID NO:X or the complement thereof, a polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, a polypeptide encoded by the portion of SEQ ID NO:B as defined in column 6 of Table 1B, and/or a polypeptide encoded by the cDNA contained in Clone ID NO:Z). In particular, N-terminal deletions may be described by the general formula m-q, where q is a whole integer representing the total number of amino acid residues in a polypeptide of the invention (e.g., the polypeptide disclosed in SEQ ID NO:Y, or the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2), and m is defined as any integer ranging from 2 to q-6. Polynucleotides encoding these polypeptides are also encompassed by the invention.

[134] The present invention further provides polypeptides having one or more residues from the carboxy terminus of the amino acid sequence of a polypeptide disclosed herein (e.g., a polypeptide of SEQ ID NO:Y, a polypeptide encoded by the polynucleotide sequence contained in SEQ ID NO:X, a polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or a polypeptide encoded by the cDNA contained in Clone ID NO:Z). In particular, C-terminal deletions may be described by the general formula 1-n, where n is any whole integer ranging from 6 to q-1, and where n corresponds to the position of amino acid residue in a polypeptide of the invention. Polynucleotides encoding these polypeptides are also encompassed by the invention.

[135] In addition, any of the above described N- or C-terminal deletions can be combined to produce a N- and C-terminal deleted polypeptide. The invention also provides polypeptides having one or more amino acids deleted from both the amino and the carboxyl termini, which may be described generally as having residues m-n of a polypeptide encoded by SEQ ID NO:X (e.g., including, but not limited to, the preferred polypeptide disclosed as SEQ ID NO:Y and the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2), the cDNA contained in Clone ID NO:Z, and/or the complement thereof, where n and m are integers as described above. Polynucleotides encoding these polypeptides are also encompassed by the invention.

[136] Also as mentioned above, even if deletion of one or more amino acids from the C-terminus of a protein results in modification or loss of one or more biological functions of the protein, other functional activities (e.g., biological activities, ability to multimerize, ability to bind a ligand) may still be retained. For example the ability of the shortened mutein to induce and/or bind to antibodies which recognize the complete or mature forms of the polypeptide generally will be retained when less than the majority of the residues of the complete or mature polypeptide are removed from the C-terminus. Whether a particular polypeptide lacking C-terminal residues of a complete polypeptide retains such immunologic activities can readily be determined by routine methods described herein and otherwise known in the art. It is not unlikely that a mutein with a large number of deleted C-terminal amino acid residues may retain some biological or immunogenic activities. In fact, peptides composed of as few as six amino acid residues may often evoke an immune response.

[137] The present application is also directed to proteins containing polypeptides at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to a polypeptide sequence set

forth herein. In preferred embodiments, the application is directed to proteins containing polypeptides at least 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to polypeptides having the amino acid sequence of the specific N- and C-terminal deletions. Polynucleotides encoding these polypeptides are also encompassed by the invention.

[138] Any polypeptide sequence encoded by, for example, the polynucleotide sequences set forth as SEQ ID NO:X or the complement thereof, (presented, for example, in Tables 1A and 2), the cDNA contained in Clone ID NO:Z, or the polynucleotide sequence as defined in column 6 of Table 1B, may be analyzed to determine certain preferred regions of the polypeptide. For example, the amino acid sequence of a polypeptide encoded by a polynucleotide sequence of SEQ ID NO:X (e.g., the polypeptide of SEQ ID NO:Y and the polypeptide encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2) or the cDNA contained in Clone ID NO:Z may be analyzed using the default parameters of the DNASTAR computer algorithm (DNASTAR, Inc., 1228 S. Park St., Madison, WI 53715 USA; <http://www.dnastar.com/>).

[139] Polypeptide regions that may be routinely obtained using the DNASTAR computer algorithm include, but are not limited to, Garnier-Robson alpha-regions, beta-regions, turn-regions, and coil-regions; Chou-Fasman alpha-regions, beta-regions, and turn-regions; Kyte-Doolittle hydrophilic regions and hydrophobic regions; Eisenberg alpha- and beta-amphipathic regions; Karplus-Schulz flexible regions; Emini surface-forming regions; and Jameson-Wolf regions of high antigenic index. Among highly preferred polynucleotides of the invention in this regard are those that encode polypeptides comprising regions that combine several structural features, such as several (e.g., 1, 2, 3 or 4) of the features set out above.

[140] Additionally, Kyte-Doolittle hydrophilic regions and hydrophobic regions, Emini surface-forming regions, and Jameson-Wolf regions of high antigenic index (i.e., containing four or more contiguous amino acids having an antigenic index of greater than or equal to 1.5, as identified using the default parameters of the Jameson-Wolf program) can routinely be used to determine polypeptide regions that exhibit a high degree of potential for antigenicity. Regions of high antigenicity are determined from data by DNASTAR analysis by choosing values which represent regions of the polypeptide which are likely to be exposed on the surface of the polypeptide in an environment in which antigen recognition may occur in the process of initiation of an immune response.

[141] Preferred polypeptide fragments of the invention are fragments comprising, or alternatively, consisting of, an amino acid sequence that displays a functional activity (e.g. biological activity) of the polypeptide sequence of which the amino acid sequence is a fragment. By a polypeptide displaying a "functional activity" is meant a polypeptide capable of one or more known functional activities associated with a full-length protein, such as, for example, biological activity, antigenicity, immunogenicity, and/or multimerization, as described herein.

[142] Other preferred polypeptide fragments are biologically active fragments. Biologically active fragments are those exhibiting activity similar, but not necessarily identical, to an activity of the polypeptide of the present invention. The biological activity of the fragments may include an improved desired activity, or a decreased undesirable activity.

[143] In preferred embodiments, polypeptides of the invention comprise, or alternatively consist of, one, two, three, four, five or more of the antigenic fragments of the polypeptide of SEQ ID NO:Y, or portions thereof. Polynucleotides encoding these polypeptides are also encompassed by the invention.

[144] The present invention encompasses polypeptides comprising, or alternatively consisting of, an epitope of: the polypeptide sequence shown in SEQ ID NO:Y; a polypeptide sequence encoded by SEQ ID NO:X or the complementary strand thereto; the polypeptide sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2; the polypeptide sequence encoded by the portion of SEQ ID NO:B as defined in column 6 of Table 1B or the complement thereto; the polypeptide sequence encoded by the cDNA contained in Clone ID NO:Z; or the polypeptide sequence encoded by a polynucleotide that hybridizes to the sequence of SEQ ID NO:X, the complement of the sequence of SEQ ID NO:X, the complement of a portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, or the cDNA sequence contained in Clone ID NO:Z under stringent hybridization conditions or alternatively, under lower stringency hybridization as defined *supra*. The present invention further encompasses polynucleotide sequences encoding an epitope of a polypeptide sequence of the invention (such as, for example, the sequence disclosed in SEQ ID NO:X, or a fragment thereof), polynucleotide sequences of the complementary strand of a polynucleotide sequence encoding an epitope of the invention, and polynucleotide sequences which hybridize to the complementary strand

under stringent hybridization conditions or alternatively, under lower stringency hybridization conditions defined *supra*.

[145] The term “epitopes,” as used herein, refers to portions of a polypeptide having antigenic or immunogenic activity in an animal, preferably a mammal, and most preferably in a human. In a preferred embodiment, the present invention encompasses a polypeptide comprising an epitope, as well as the polynucleotide encoding this polypeptide. An “immunogenic epitope,” as used herein, is defined as a portion of a protein that elicits an antibody response in an animal, as determined by any method known in the art, for example, by the methods for generating antibodies described *infra*. (See, for example, Geysen et al., Proc. Natl. Acad. Sci. USA 81:3998- 4002 (1983)). The term “antigenic epitope,” as used herein, is defined as a portion of a protein to which an antibody can immunospecifically bind its antigen as determined by any method well known in the art, for example, by the immunoassays described herein. Immunospecific binding excludes non-specific binding but does not necessarily exclude cross- reactivity with other antigens. Antigenic epitopes need not necessarily be immunogenic.

[146] Fragments which function as epitopes may be produced by any conventional means. (See, e.g., Houghten, R. A., Proc. Natl. Acad. Sci. USA 82:5131-5135 (1985) further described in U.S. Patent No. 4,631,211.)

[147] In the present invention, antigenic epitopes preferably contain a sequence of at least 4, at least 5, at least 6, at least 7, more preferably at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 20, at least 25, at least 30, at least 40, at least 50, and, most preferably, between about 15 to about 30 amino acids. Preferred polypeptides comprising immunogenic or antigenic epitopes are at least 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, or 100 amino acid residues in length. Additional non-exclusive preferred antigenic epitopes include the antigenic epitopes disclosed herein, as well as portions thereof. Antigenic epitopes are useful, for example, to raise antibodies, including monoclonal antibodies, that specifically bind the epitope. Preferred antigenic epitopes include the antigenic epitopes disclosed herein, as well as any combination of two, three, four, five or more of these antigenic epitopes. Antigenic epitopes can be used as the target molecules in immunoassays. (See, for instance, Wilson et al., Cell 37:767-778 (1984); Sutcliffe et al., Science 219:660-666 (1983)).

[148] Non-limiting examples of epitopes of polypeptides that can be used to generate antibodies of the invention include a polypeptide comprising, or alternatively consisting of,

at least one, two, three, four, five, six or more of the portion(s) of SEQ ID NO:Y specified in column 7 of Table 1A. These polypeptide fragments have been determined to bear antigenic epitopes of the proteins of the invention by the analysis of the Jameson-Wolf antigenic index which is included in the DNASTar suite of computer programs. By "comprise" it is intended that a polypeptide contains at least one, two, three, four, five, six or more of the portion(s) of SEQ ID NO:Y shown in column 7 of Table 1A, but it may contain additional flanking residues on either the amino or carboxyl termini of the recited portion. Such additional flanking sequences are preferably sequences naturally found adjacent to the portion; i.e., contiguous sequence shown in SEQ ID NO:Y. The flanking sequence may, however, be sequences from a heterologous polypeptide, such as from another protein described herein or from a heterologous polypeptide not described herein. In particular embodiments, epitope portions of a polypeptide of the invention comprise one, two, three, or more of the portions of SEQ ID NO:Y shown in column 7 of Table 1A.

[149] Similarly, immunogenic epitopes can be used, for example, to induce antibodies according to methods well known in the art. See, for instance, Sutcliffe et al., *supra*; Wilson et al., *supra*; Chow et al., Proc. Natl. Acad. Sci. USA 82:910-914; and Bittle et al., J. Gen. Virol. 66:2347-2354 (1985). Preferred immunogenic epitopes include the immunogenic epitopes disclosed herein, as well as any combination of two, three, four, five or more of these immunogenic epitopes. The polypeptides comprising one or more immunogenic epitopes may be presented for eliciting an antibody response together with a carrier protein, such as an albumin, to an animal system (such as rabbit or mouse), or, if the polypeptide is of sufficient length (at least about 25 amino acids), the polypeptide may be presented without a carrier. However, immunogenic epitopes comprising as few as 8 to 10 amino acids have been shown to be sufficient to raise antibodies capable of binding to, at the very least, linear epitopes in a denatured polypeptide (e.g., in Western blotting).

[150] Epitope-bearing polypeptides of the present invention may be used to induce antibodies according to methods well known in the art including, but not limited to, *in vivo* immunization, *in vitro* immunization, and phage display methods. See, e.g., Sutcliffe et al., *supra*; Wilson et al., *supra*, and Bittle et al., J. Gen. Virol., 66:2347-2354 (1985). If *in vivo* immunization is used, animals may be immunized with free peptide; however, anti-peptide antibody titer may be boosted by coupling the peptide to a macromolecular carrier, such as keyhole limpet hemacyanin (KLH) or tetanus toxoid. For instance, peptides containing cysteine residues may be coupled to a carrier using a linker such as maleimidobenzoyl- N-

hydroxysuccinimide ester (MBS), while other peptides may be coupled to carriers using a more general linking agent such as glutaraldehyde. Animals such as rabbits, rats and mice are immunized with either free or carrier- coupled peptides, for instance, by intraperitoneal and/or intradermal injection of emulsions containing about 100 µg of peptide or carrier protein and Freund's adjuvant or any other adjuvant known for stimulating an immune response. Several booster injections may be needed, for instance, at intervals of about two weeks, to provide a useful titer of anti-peptide antibody which can be detected, for example, by ELISA assay using free peptide adsorbed to a solid surface. The titer of anti-peptide antibodies in serum from an immunized animal may be increased by selection of anti-peptide antibodies, for instance, by adsorption to the peptide on a solid support and elution of the selected antibodies according to methods well known in the art.

[151] As one of skill in the art will appreciate, and as discussed above, the polypeptides of the present invention (e.g., those comprising an immunogenic or antigenic epitope) can be fused to heterologous polypeptide sequences. For example, polypeptides of the present invention (including fragments or variants thereof), may be fused with the constant domain of immunoglobulins (IgA, IgE, IgG, IgM), or portions thereof (CH1, CH2, CH3, or any combination thereof and portions thereof, resulting in chimeric polypeptides. By way of another non-limiting example, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) may be fused with albumin (including but not limited to recombinant human serum albumin or fragments or variants thereof (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998, herein incorporated by reference in their entirety)). In a preferred embodiment, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) are fused with the mature form of human serum albumin (i.e., amino acids 1 – 585 of human serum albumin as shown in Figures 1 and 2 of EP Patent 0 322 094) which is herein incorporated by reference in its entirety. In another preferred embodiment, polypeptides and/or antibodies of the present invention (including fragments or variants thereof) are fused with polypeptide fragments comprising, or alternatively consisting of, amino acid residues 1-z of human serum albumin, where z is an integer from 369 to 419, as described in U.S. Patent 5,766,883 herein incorporated by reference in its entirety. Polypeptides and/or antibodies of the present invention (including fragments or variants thereof) may be fused to either the N- or C-terminal end of the heterologous protein (e.g., immunoglobulin Fc polypeptide or human serum albumin polypeptide).

Polynucleotides encoding fusion proteins of the invention are also encompassed by the invention.

[152] Such fusion proteins as those described above may facilitate purification and may increase half-life *in vivo*. This has been shown for chimeric proteins consisting of the first two domains of the human CD4-polypeptide and various domains of the constant regions of the heavy or light chains of mammalian immunoglobulins. See, e.g., EP 394,827; Traunecker et al., *Nature*, 331:84-86 (1988). Enhanced delivery of an antigen across the epithelial barrier to the immune system has been demonstrated for antigens (e.g., insulin) conjugated to an FcRn binding partner such as IgG or Fc fragments (see, e.g., PCT Publications WO 96/22024 and WO 99/04813). IgG fusion proteins that have a disulfide-linked dimeric structure due to the IgG portion disulfide bonds have also been found to be more efficient in binding and neutralizing other molecules than monomeric polypeptides or fragments thereof alone. See, e.g., Fountoulakis et al., *J. Biochem.*, 270:3958-3964 (1995). Nucleic acids encoding the above epitopes can also be recombined with a gene of interest as an epitope tag (e.g., the hemagglutinin (HA) tag or flag tag) to aid in detection and purification of the expressed polypeptide. For example, a system described by Janknecht et al. allows for the ready purification of non-denatured fusion proteins expressed in human cell lines (Janknecht et al., 1991, *Proc. Natl. Acad. Sci. USA* 88:8972-897). In this system, the gene of interest is subcloned into a vaccinia recombination plasmid such that the open reading frame of the gene is translationally fused to an amino-terminal tag consisting of six histidine residues. The tag serves as a matrix binding domain for the fusion protein. Extracts from cells infected with the recombinant vaccinia virus are loaded onto Ni²⁺ nitriloacetic acid-agarose column and histidine-tagged proteins can be selectively eluted with imidazole-containing buffers.

Fusion Proteins

[153] Any polypeptide of the present invention can be used to generate fusion proteins. For example, the polypeptide of the present invention, when fused to a second protein, can be used as an antigenic tag. Antibodies raised against the polypeptide of the present invention can be used to indirectly detect the second protein by binding to the polypeptide. Moreover, because secreted proteins target cellular locations based on trafficking signals, polypeptides of the present invention which are shown to be secreted can be used as targeting molecules once fused to other proteins.

[154] Examples of domains that can be fused to polypeptides of the present invention include not only heterologous signal sequences, but also other heterologous functional regions. The fusion does not necessarily need to be direct, but may occur through linker sequences.

[155] In certain preferred embodiments, proteins of the invention are fusion proteins comprising an amino acid sequence that is an N and/or C- terminal deletion of a polypeptide of the invention. In preferred embodiments, the invention is directed to a fusion protein comprising an amino acid sequence that is at least 90%, 95%, 96%, 97%, 98% or 99% identical to a polypeptide sequence of the invention. Polynucleotides encoding these proteins are also encompassed by the invention.

[156] Moreover, fusion proteins may also be engineered to improve characteristics of the polypeptide of the present invention. For instance, a region of additional amino acids, particularly charged amino acids, may be added to the N-terminus of the polypeptide to improve stability and persistence during purification from the host cell or subsequent handling and storage. Also, peptide moieties may be added to the polypeptide to facilitate purification. Such regions may be removed prior to final preparation of the polypeptide. The addition of peptide moieties to facilitate handling of polypeptides are familiar and routine techniques in the art.

[157] As one of skill in the art will appreciate that, as discussed above, polypeptides of the present invention, and epitope-bearing fragments thereof, can be combined with heterologous polypeptide sequences. For example, the polypeptides of the present invention may be fused with heterologous polypeptide sequences, for example, the polypeptides of the present invention may be fused with the constant domain of immunoglobulins (IgA, IgE, IgG, IgM) or portions thereof (CH1, CH2, CH3, and any combination thereof, including both entire domains and portions thereof), or albumin (including, but not limited to, native or recombinant human albumin or fragments or variants thereof (see, e.g., U.S. Patent No. 5,876,969, issued March 2, 1999, EP Patent 0 413 622, and U.S. Patent No. 5,766,883, issued June 16, 1998, herein incorporated by reference in their entirety)), resulting in chimeric polypeptides. For example, EP-A-O 464 533 (Canadian counterpart 2045869) discloses fusion proteins comprising various portions of constant region of immunoglobulin molecules together with another human protein or part thereof. In many cases, the Fc part in a fusion protein is beneficial in therapy and diagnosis, and thus can result in, for example, improved pharmacokinetic properties (EP-A

0232 262). Alternatively, deleting the Fc part after the fusion protein has been expressed, detected, and purified, would be desired. For example, the Fc portion may hinder therapy and diagnosis if the fusion protein is used as an antigen for immunizations. In drug discovery, for example, human proteins, such as hIL-5, have been fused with Fc portions for the purpose of high-throughput screening assays to identify antagonists of hIL-5. See, D. Bennett et al., *J. Molecular Recognition* 8:52-58 (1995); K. Johanson et al., *J. Biol. Chem.* 270:9459-9471 (1995).

[158] Moreover, the polypeptides of the present invention can be fused to marker sequences, such as a polypeptide which facilitates purification of the fused polypeptide. In preferred embodiments, the marker amino acid sequence is a hexa-histidine peptide, such as the tag provided in a pQE vector (QIAGEN, Inc., 9259 Eton Avenue, Chatsworth, CA, 91311), among others, many of which are commercially available. As described in Gentz et al., *Proc. Natl. Acad. Sci. USA* 86:821-824 (1989), for instance, hexa-histidine provides for convenient purification of the fusion protein. Another peptide tag useful for purification, the "HA" tag, corresponds to an epitope derived from the influenza hemagglutinin protein (Wilson et al., *Cell* 37:767 (1984)).

[159] Additional fusion proteins of the invention may be generated through the techniques of gene-shuffling, motif-shuffling, exon-shuffling, and/or codon-shuffling (collectively referred to as "DNA shuffling"). DNA shuffling may be employed to modulate the activities of polypeptides of the invention, such methods can be used to generate polypeptides with altered activity, as well as agonists and antagonists of the polypeptides. See, generally, U.S. Patent Nos. 5,605,793; 5,811,238; 5,830,721; 5,834,252; and 5,837,458, and Patten et al., *Curr. Opinion Biotechnol.* 8:724-33 (1997); Harayama, *Trends Biotechnol.* 16(2):76-82 (1998); Hansson, et al., *J. Mol. Biol.* 287:265-76 (1999); and Lorenzo and Blasco, *Biotechniques* 24(2):308- 13 (1998) (each of these patents and publications are hereby incorporated by reference in its entirety). In one embodiment, alteration of polynucleotides corresponding to SEQ ID NO:X and the polypeptides encoded by these polynucleotides may be achieved by DNA shuffling. DNA shuffling involves the assembly of two or more DNA segments by homologous or site-specific recombination to generate variation in the polynucleotide sequence. In another embodiment, polynucleotides of the invention, or the encoded polypeptides, may be altered by being subjected to random mutagenesis by error-prone PCR, random nucleotide insertion or other methods prior to recombination. In another embodiment, one or more components, motifs, sections, parts,

domains, fragments, etc., of a polynucleotide encoding a polypeptide of the invention may be recombined with one or more components, motifs, sections, parts, domains, fragments, etc. of one or more heterologous molecules.

[160] Thus, any of these above fusions can be engineered using the polynucleotides or the polypeptides of the present invention.

Recombinant and Synthetic Production of Polypeptides of the Invention

[161] The present invention also relates to vectors containing the polynucleotide of the present invention, host cells, and the production of polypeptides by synthetic and recombinant techniques. The vector may be, for example, a phage, plasmid, viral, or retroviral vector. Retroviral vectors may be replication competent or replication defective. In the latter case, viral propagation generally will occur only in complementing host cells.

[162] The polynucleotides of the invention may be joined to a vector containing a selectable marker for propagation in a host. Generally, a plasmid vector is introduced in a precipitate, such as a calcium phosphate precipitate, or in a complex with a charged lipid. If the vector is a virus, it may be packaged in vitro using an appropriate packaging cell line and then transduced into host cells.

[163] The polynucleotide insert should be operatively linked to an appropriate promoter, such as the phage lambda PL promoter, the E. coli lac, trp, phoA and tac promoters, the SV40 early and late promoters and promoters of retroviral LTRs, to name a few. Other suitable promoters will be known to the skilled artisan. The expression constructs will further contain sites for transcription initiation, termination, and, in the transcribed region, a ribosome binding site for translation. The coding portion of the transcripts expressed by the constructs will preferably include a translation initiating codon at the beginning and a termination codon (UAA, UGA or UAG) appropriately positioned at the end of the polypeptide to be translated.

[164] As indicated, the expression vectors will preferably include at least one selectable marker. Such markers include dihydrofolate reductase, G418, glutamine synthase, or neomycin resistance for eukaryotic cell culture, and tetracycline, kanamycin or ampicillin resistance genes for culturing in E. coli and other bacteria. Representative examples of appropriate hosts include, but are not limited to, bacterial cells, such as E. coli, Streptomyces and Salmonella typhimurium cells; fungal cells, such as yeast cells (e.g., Saccharomyces cerevisiae or Pichia pastoris (ATCC Accession No. 201178)); insect cells

such as *Drosophila* S2 and *Spodoptera* Sf9 cells; animal cells such as CHO, COS, 293, and Bowes melanoma cells; and plant cells. Appropriate culture mediums and conditions for the above-described host cells are known in the art.

[165] Among vectors preferred for use in bacteria include pQE70, pQE60 and pQE-9, available from QIAGEN, Inc.; pBluescript vectors, Phagescript vectors, pNH8A, pNH16a, pNH18A, pNH46A, available from Stratagene Cloning Systems, Inc.; and ptrc99a, pKK223-3, pKK233-3, pDR540, pRIT5 available from Pharmacia Biotech, Inc. Among preferred eukaryotic vectors are pWLNEO, pSV2CAT, pOG44, pXT1 and pSG available from Stratagene; and pSVK3, pBPV, pMSG and pSVL available from Pharmacia. Preferred expression vectors for use in yeast systems include, but are not limited to pYES2, pYD1, pTEF1/Zeo, pYES2/GS, pPICZ, pGAPZ, pGAPZalph, pPIC9, pPIC3.5, pHIL-D2, pHIL-S1, pPIC3.5K, pPIC9K, and PAO815 (all available from Invitrogen, Carlsbad, CA). Other suitable vectors will be readily apparent to the skilled artisan.

[166] Vectors which use glutamine synthase (GS) or DHFR as the selectable markers can be amplified in the presence of the drugs methionine sulfoximine or methotrexate, respectively. An advantage of glutamine synthase based vectors are the availability of cell lines (e.g., the murine myeloma cell line, NS0) which are glutamine synthase negative. Glutamine synthase expression systems can also function in glutamine synthase expressing cells (e.g., Chinese Hamster Ovary (CHO) cells) by providing additional inhibitor to prevent the functioning of the endogenous gene. A glutamine synthase expression system and components thereof are detailed in PCT publications: WO87/04462; WO86/05807; WO89/01036; WO89/10404; and WO91/06657, which are hereby incorporated in their entireties by reference herein. Additionally, glutamine synthase expression vectors can be obtained from Lonza Biologics, Inc. (Portsmouth, NH). Expression and production of monoclonal antibodies using a GS expression system in murine myeloma cells is described in Bebbington *et al.*, *Bio/technology* 10:169(1992) and in Biblia and Robinson *Biotechnol. Prog.* 11:1 (1995) which are herein incorporated by reference.

[167] The present invention also relates to host cells containing the above-described vector constructs described herein, and additionally encompasses host cells containing nucleotide sequences of the invention that are operably associated with one or more heterologous control regions (e.g., promoter and/or enhancer) using techniques known of in the art. The host cell can be a higher eukaryotic cell, such as a mammalian cell (e.g., a human derived cell), or a lower eukaryotic cell, such as a yeast cell, or the host cell can be a

prokaryotic cell, such as a bacterial cell. A host strain may be chosen which modulates the expression of the inserted gene sequences, or modifies and processes the gene product in the specific fashion desired. Expression from certain promoters can be elevated in the presence of certain inducers; thus expression of the genetically engineered polypeptide may be controlled. Furthermore, different host cells have characteristics and specific mechanisms for the translational and post-translational processing and modification (e.g., phosphorylation, cleavage) of proteins. Appropriate cell lines can be chosen to ensure the desired modifications and processing of the foreign protein expressed.

[168] Introduction of the nucleic acids and nucleic acid constructs of the invention into the host cell can be effected by calcium phosphate transfection, DEAE-dextran mediated transfection, cationic lipid-mediated transfection, electroporation, transduction, infection, or other methods. Such methods are described in many standard laboratory manuals, such as Davis et al., *Basic Methods In Molecular Biology* (1986). It is specifically contemplated that the polypeptides of the present invention may in fact be expressed by a host cell lacking a recombinant vector.

[169] In addition to encompassing host cells containing the vector constructs discussed herein, the invention also encompasses primary, secondary, and immortalized host cells of vertebrate origin, particularly mammalian origin, that have been engineered to delete or replace endogenous genetic material (e.g., the coding sequence), and/or to include genetic material (e.g., heterologous polynucleotide sequences) that is operably associated with polynucleotides of the invention, and which activates, alters, and/or amplifies endogenous polynucleotides. For example, techniques known in the art may be used to operably associate heterologous control regions (e.g., promoter and/or enhancer) and endogenous polynucleotide sequences via homologous recombination (see, e.g., US Patent Number 5,641,670, issued June 24, 1997; International Publication Number WO 96/29411; International Publication Number WO 94/12650; Koller *et al.*, *Proc. Natl. Acad. Sci. USA* 86:8932-8935 (1989); and Zijlstra *et al.*, *Nature* 342:435-438 (1989), the disclosures of each of which are incorporated by reference in their entirety).

[170] Polypeptides of the invention can be recovered and purified from recombinant cell cultures by well-known methods including ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography,

hydroxylapatite chromatography and lectin chromatography. Most preferably, high performance liquid chromatography ("HPLC") is employed for purification.

[171] Polypeptides of the present invention can also be recovered from: products purified from natural sources, including bodily fluids, tissues and cells, whether directly isolated or cultured; products of chemical synthetic procedures; and products produced by recombinant techniques from a prokaryotic or eukaryotic host, including, for example, bacterial, yeast, higher plant, insect, and mammalian cells. Depending upon the host employed in a recombinant production procedure, the polypeptides of the present invention may be glycosylated or may be non-glycosylated. In addition, polypeptides of the invention may also include an initial modified methionine residue, in some cases as a result of host-mediated processes. Thus, it is well known in the art that the N-terminal methionine encoded by the translation initiation codon generally is removed with high efficiency from any protein after translation in all eukaryotic cells. While the N-terminal methionine on most proteins also is efficiently removed in most prokaryotes, for some proteins, this prokaryotic removal process is inefficient, depending on the nature of the amino acid to which the N-terminal methionine is covalently linked.

[172] In one embodiment, the yeast *Pichia pastoris* is used to express polypeptides of the invention in a eukaryotic system. *Pichia pastoris* is a methylotrophic yeast which can metabolize methanol as its sole carbon source. A main step in the methanol metabolization pathway is the oxidation of methanol to formaldehyde using O₂. This reaction is catalyzed by the enzyme alcohol oxidase. In order to metabolize methanol as its sole carbon source, *Pichia pastoris* must generate high levels of alcohol oxidase due, in part, to the relatively low affinity of alcohol oxidase for O₂. Consequently, in a growth medium depending on methanol as a main carbon source, the promoter region of one of the two alcohol oxidase genes (*AOX1*) is highly active. In the presence of methanol, alcohol oxidase produced from the *AOX1* gene comprises up to approximately 30% of the total soluble protein in *Pichia pastoris*. See Ellis, S.B., *et al.*, *Mol. Cell. Biol.* 5:1111-21 (1985); Koutz, P.J., *et al.*, *Yeast* 5:167-77 (1989); Tschopp, J.F., *et al.*, *Nucl. Acids Res.* 15:3859-76 (1987). Thus, a heterologous coding sequence, such as, for example, a polynucleotide of the present invention, under the transcriptional regulation of all or part of the *AOX1* regulatory sequence is expressed at exceptionally high levels in *Pichia* yeast grown in the presence of methanol.

[173] In one example, the plasmid vector pPIC9K is used to express DNA encoding a polypeptide of the invention, as set forth herein, in a *Pichia* yeast system essentially as described in "*Pichia* Protocols: Methods in Molecular Biology," D.R. Higgins and J. Cregg, eds. The Humana Press, Totowa, NJ, 1998. This expression vector allows expression and secretion of a polypeptide of the invention by virtue of the strong *AOX1* promoter linked to the *Pichia pastoris* alkaline phosphatase (PHO) secretory signal peptide (i.e., leader) located upstream of a multiple cloning site.

[174] Many other yeast vectors could be used in place of pPIC9K, such as, pYES2, pYD1, pTEF1/Zeo, pYES2/GS, pPICZ, pGAPZ, pGAPZalpha, pPIC9, pPIC3.5, pHIL-D2, pHIL-S1, pPIC3.5K, and PAO815, as one skilled in the art would readily appreciate, as long as the proposed expression construct provides appropriately located signals for transcription, translation, secretion (if desired), and the like, including an in-frame AUG as required.

[175] In another embodiment, high-level expression of a heterologous coding sequence, such as, for example, a polynucleotide of the present invention, may be achieved by cloning the heterologous polynucleotide of the invention into an expression vector such as, for example, pGAPZ or pGAPZalpha, and growing the yeast culture in the absence of methanol.

[176] In addition to encompassing host cells containing the vector constructs discussed herein, the invention also encompasses primary, secondary, and immortalized host cells of vertebrate origin, particularly mammalian origin, that have been engineered to delete or replace endogenous genetic material (e.g., coding sequence), and/or to include genetic material (e.g., heterologous polynucleotide sequences) that is operably associated with polynucleotides of the invention, and which activates, alters, and/or amplifies endogenous polynucleotides. For example, techniques known in the art may be used to operably associate heterologous control regions (e.g., promoter and/or enhancer) and endogenous polynucleotide sequences via homologous recombination (see, e.g., U.S. Patent No. 5,641,670, issued June 24, 1997; International Publication No. WO 96/29411, published September 26, 1996; International Publication No. WO 94/12650, published August 4, 1994; Koller et al., Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989); and Zijlstra et al., Nature 342:435-438 (1989), the disclosures of each of which are incorporated by reference in their entireties).

[177] In addition, polypeptides of the invention can be chemically synthesized using techniques known in the art (e.g., see Creighton, 1983, *Proteins: Structures and Molecular Principles*, W.H. Freeman & Co., N.Y., and Hunkapiller et al., *Nature*, 310:105-111 (1984)). For example, a polypeptide corresponding to a fragment of a polypeptide can be synthesized by use of a peptide synthesizer. Furthermore, if desired, nonclassical amino acids or chemical amino acid analogs can be introduced as a substitution or addition into the polypeptide sequence. Non-classical amino acids include, but are not limited to, to the D-isomers of the common amino acids, 2,4-diaminobutyric acid, α -amino isobutyric acid, 4-aminobutyric acid, Abu, 2-amino butyric acid, g-Abu, e-Ahx, 6-amino hexanoic acid, Aib, 2-amino isobutyric acid, 3-amino propionic acid, ornithine, norleucine, norvaline, hydroxyproline, sarcosine, citrulline, homocitrulline, cysteic acid, t-butylglycine, t-butylalanine, phenylglycine, cyclohexylalanine, b-alanine, fluoro-amino acids, designer amino acids such as b-methyl amino acids, Ca-methyl amino acids, Na-methyl amino acids, and amino acid analogs in general. Furthermore, the amino acid can be D (dextrorotary) or L (levorotary).

[178] The invention encompasses polypeptides of the present invention which are differentially modified during or after translation, e.g., by glycosylation, acetylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to an antibody molecule or other cellular ligand, etc. Any of numerous chemical modifications may be carried out by known techniques, including but not limited, to specific chemical cleavage by cyanogen bromide, trypsin, chymotrypsin, papain, V8 protease, NaBH_4 ; acetylation, formylation, oxidation, reduction; metabolic synthesis in the presence of tunicamycin; etc.

[179] Additional post-translational modifications encompassed by the invention include, for example, e.g., N-linked or O-linked carbohydrate chains, processing of N-terminal or C-terminal ends), attachment of chemical moieties to the amino acid backbone, chemical modifications of N-linked or O-linked carbohydrate chains, and addition or deletion of an N-terminal methionine residue as a result of procaryotic host cell expression. The polypeptides may also be modified with a detectable label, such as an enzymatic, fluorescent, isotopic or affinity label to allow for detection and isolation of the protein.

[180] Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, beta-galactosidase, or acetylcholinesterase; examples of suitable prosthetic

group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine fluorescein, dansyl chloride or phycoerythrin; an example of a luminescent material includes luminol; examples of bioluminescent materials include luciferase, luciferin, and aequorin; and examples of suitable radioactive material include iodine (^{121}I , ^{123}I , ^{125}I , ^{131}I), carbon (^{14}C), sulfur (^{35}S), tritium (^3H), indium (^{111}In , ^{112}In , $^{113\text{m}}\text{In}$, $^{115\text{m}}\text{In}$), technetium (^{99}Tc , $^{99\text{m}}\text{Tc}$), thallium (^{201}Tl), gallium (^{68}Ga , ^{67}Ga), palladium (^{103}Pd), molybdenum (^{99}Mo), xenon (^{133}Xe), fluorine (^{18}F), ^{153}Sm , ^{177}Lu , ^{159}Gd , ^{149}Pm , ^{140}La , ^{175}Yb , ^{166}Ho , ^{90}Y , ^{47}Sc , ^{186}Re , ^{188}Re , ^{142}Pr , ^{105}Rh , and ^{97}Ru .

[181] In specific embodiments, a polypeptide of the present invention or fragment or variant thereof is attached to macrocyclic chelators that associate with radiometal ions, including but not limited to, ^{177}Lu , ^{90}Y , ^{166}Ho , and ^{153}Sm , to polypeptides. In a preferred embodiment, the radiometal ion associated with the macrocyclic chelators is ^{111}In . In another preferred embodiment, the radiometal ion associated with the macrocyclic chelator is ^{90}Y . In specific embodiments, the macrocyclic chelator is 1,4,7,10-tetraazacyclododecane-N,N',N'',N'''-tetraacetic acid (DOTA). In other specific embodiments, DOTA is attached to an antibody of the invention or fragment thereof via a linker molecule. Examples of linker molecules useful for conjugating DOTA to a polypeptide are commonly known in the art - see, for example, DeNardo et al., *Clin Cancer Res.* 4(10):2483-90 (1998); Peterson et al., *Bioconjug. Chem.* 10(4):553-7 (1999); and Zimmerman et al, *Nucl. Med. Biol.* 26(8):943-50 (1999); which are hereby incorporated by reference in their entirety.

[182] As mentioned, the proteins of the invention may be modified by either natural processes, such as posttranslational processing, or by chemical modification techniques which are well known in the art. It will be appreciated that the same type of modification may be present in the same or varying degrees at several sites in a given polypeptide. Polypeptides of the invention may be branched, for example, as a result of ubiquitination, and they may be cyclic, with or without branching. Cyclic, branched, and branched cyclic polypeptides may result from posttranslation natural processes or may be made by synthetic methods. Modifications include acetylation, acylation, ADP-ribosylation, amidation, covalent attachment of flavin, covalent attachment of a heme moiety, covalent attachment of a nucleotide or nucleotide derivative, covalent attachment of a lipid or lipid derivative, covalent attachment of phosphatidylinositol, cross-linking, cyclization, disulfide bond

formation, demethylation, formation of covalent cross-links, formation of cysteine, formation of pyroglutamate, formylation, gamma-carboxylation, glycosylation, GPI anchor formation, hydroxylation, iodination, methylation, myristoylation, oxidation, pegylation, proteolytic processing, phosphorylation, prenylation, racemization, selenoylation, sulfation, transfer-RNA mediated addition of amino acids to proteins such as arginylation, and ubiquitination. (See, for instance, PROTEINS - STRUCTURE AND MOLECULAR PROPERTIES, 2nd Ed., T. E. Creighton, W. H. Freeman and Company, New York (1993); POSTTRANSLATIONAL COVALENT MODIFICATION OF PROTEINS, B. C. Johnson, Ed., Academic Press, New York, pgs. 1-12 (1983); Seifter et al., Meth. Enzymol. 182:626-646 (1990); Rattan et al., Ann. N.Y. Acad. Sci. 663:48-62 (1992)).

[183] Also provided by the invention are chemically modified derivatives of the polypeptides of the invention which may provide additional advantages such as increased solubility, stability and circulating time of the polypeptide, or decreased immunogenicity (see U.S. Patent No. 4,179,337). The chemical moieties for derivitization may be selected from water soluble polymers such as polyethylene glycol, ethylene glycol/propylene glycol copolymers, carboxymethylcellulose, dextran, polyvinyl alcohol and the like. The polypeptides may be modified at random positions within the molecule, or at predetermined positions within the molecule and may include one, two, three or more attached chemical moieties.

[184] The polymer may be of any molecular weight, and may be branched or unbranched. For polyethylene glycol, the preferred molecular weight is between about 1 kDa and about 100 kDa (the term "about" indicating that in preparations of polyethylene glycol, some molecules will weigh more, some less, than the stated molecular weight) for ease in handling and manufacturing. Other sizes may be used, depending on the desired therapeutic profile (e.g., the duration of sustained release desired, the effects, if any on biological activity, the ease in handling, the degree or lack of antigenicity and other known effects of the polyethylene glycol to a therapeutic protein or analog). For example, the polyethylene glycol may have an average molecular weight of about 200, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10,000, 10,500, 11,000, 11,500, 12,000, 12,500, 13,000, 13,500, 14,000, 14,500, 15,000, 15,500, 16,000, 16,500, 17,000, 17,500, 18,000, 18,500, 19,000, 19,500, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000, 50,000, 55,000, 60,000, 65,000, 70,000, 75,000, 80,000, 85,000, 90,000, 95,000, or 100,000 kDa.

[185] As noted above, the polyethylene glycol may have a branched structure. Branched polyethylene glycols are described, for example, in U.S. Patent No. 5,643,575; Morpurgo *et al.*, *Appl. Biochem. Biotechnol.* 56:59-72 (1996); Vorobjev *et al.*, *Nucleosides Nucleotides* 18:2745-2750 (1999); and Caliceti *et al.*, *Bioconjug. Chem.* 10:638-646 (1999), the disclosures of each of which are incorporated herein by reference.

[186] The polyethylene glycol molecules (or other chemical moieties) should be attached to the protein with consideration of effects on functional or antigenic domains of the protein. There are a number of attachment methods available to those skilled in the art, such as, for example, the method disclosed in EP 0 401 384 (coupling PEG to G-CSF), herein incorporated by reference; see also Malik *et al.*, *Exp. Hematol.* 20:1028-1035 (1992), reporting pegylation of GM-CSF using tresyl chloride. For example, polyethylene glycol may be covalently bound through amino acid residues via a reactive group, such as a free amino or carboxyl group. Reactive groups are those to which an activated polyethylene glycol molecule may be bound. The amino acid residues having a free amino group may include lysine residues and the N-terminal amino acid residues; those having a free carboxyl group may include aspartic acid residues glutamic acid residues and the C-terminal amino acid residue. Sulfhydryl groups may also be used as a reactive group for attaching the polyethylene glycol molecules. Preferred for therapeutic purposes is attachment at an amino group, such as attachment at the N-terminus or lysine group.

[187] As suggested above, polyethylene glycol may be attached to proteins via linkage to any of a number of amino acid residues. For example, polyethylene glycol can be linked to proteins via covalent bonds to lysine, histidine, aspartic acid, glutamic acid, or cysteine residues. One or more reaction chemistries may be employed to attach polyethylene glycol to specific amino acid residues (e.g., lysine, histidine, aspartic acid, glutamic acid, or cysteine) of the protein or to more than one type of amino acid residue (e.g., lysine, histidine, aspartic acid, glutamic acid, cysteine and combinations thereof) of the protein.

[188] One may specifically desire proteins chemically modified at the N-terminus. Using polyethylene glycol as an illustration of the present composition, one may select from a variety of polyethylene glycol molecules (by molecular weight, branching, etc.), the proportion of polyethylene glycol molecules to protein (polypeptide) molecules in the reaction mix, the type of pegylation reaction to be performed, and the method of obtaining the selected N-terminally pegylated protein. The method of obtaining the N-terminally pegylated preparation (i.e., separating this moiety from other monopegylated moieties if

necessary) may be by purification of the N-terminally pegylated material from a population of pegylated protein molecules. Selective proteins chemically modified at the N-terminus modification may be accomplished by reductive alkylation which exploits differential reactivity of different types of primary amino groups (lysine versus the N-terminal) available for derivatization in a particular protein. Under the appropriate reaction conditions, substantially selective derivatization of the protein at the N-terminus with a carbonyl group containing polymer is achieved.

[189] As indicated above, pegylation of the proteins of the invention may be accomplished by any number of means. For example, polyethylene glycol may be attached to the protein either directly or by an intervening linker. Linkerless systems for attaching polyethylene glycol to proteins are described in Delgado et al., Crit. Rev. Thera. Drug Carrier Sys. 9:249-304 (1992); Francis et al., Intern. J. of Hematol. 68:1-18 (1998); U.S. Patent No. 4,002,531; U.S. Patent No. 5,349,052; WO 95/06058; and WO 98/32466, the disclosures of each of which are incorporated herein by reference.

[190] One system for attaching polyethylene glycol directly to amino acid residues of proteins without an intervening linker employs tresylated MPEG, which is produced by the modification of monmethoxy polyethylene glycol (MPEG) using tresylchloride ($\text{ClSO}_2\text{CH}_2\text{CF}_3$). Upon reaction of protein with tresylated MPEG, polyethylene glycol is directly attached to amine groups of the protein. Thus, the invention includes protein-polyethylene glycol conjugates produced by reacting proteins of the invention with a polyethylene glycol molecule having a 2,2,2-trifluoroethane sulphonyl group.

[191] Polyethylene glycol can also be attached to proteins using a number of different intervening linkers. For example, U.S. Patent No. 5,612,460, the entire disclosure of which is incorporated herein by reference, discloses urethane linkers for connecting polyethylene glycol to proteins. Protein-polyethylene glycol conjugates wherein the polyethylene glycol is attached to the protein by a linker can also be produced by reaction of proteins with compounds such as MPEG-succinimidylsuccinate, MPEG activated with 1,1'-carbonyldiimidazole, MPEG-2,4,5-trichloropenylcarbonate, MPEG-p-nitrophenolcarbonate, and various MPEG-succinate derivatives. A number of additional polyethylene glycol derivatives and reaction chemistries for attaching polyethylene glycol to proteins are described in International Publication No. WO 98/32466, the entire disclosure of which is incorporated herein by reference. Pegylated protein products

produced using the reaction chemistries set out herein are included within the scope of the invention.

[192] The number of polyethylene glycol moieties attached to each protein of the invention (i.e., the degree of substitution) may also vary. For example, the pegylated proteins of the invention may be linked, on average, to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 17, 20, or more polyethylene glycol molecules. Similarly, the average degree of substitution within ranges such as 1-3, 2-4, 3-5, 4-6, 5-7, 6-8, 7-9, 8-10, 9-11, 10-12, 11-13, 12-14, 13-15, 14-16, 15-17, 16-18, 17-19, or 18-20 polyethylene glycol moieties per protein molecule. Methods for determining the degree of substitution are discussed, for example, in Delgado et al., *Crit. Rev. Thera. Drug Carrier Sys.* 9:249-304 (1992).

[193] The polypeptides of the invention can be recovered and purified from chemical synthesis and recombinant cell cultures by standard methods which include, but are not limited to, ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography and lectin chromatography. Most preferably, high performance liquid chromatography ("HPLC") is employed for purification. Well known techniques for refolding protein may be employed to regenerate active conformation when the polypeptide is denatured during isolation and/or purification.

[194] The polypeptides of the invention may be in monomers or multimers (i.e., dimers, trimers, tetramers and higher multimers). Accordingly, the present invention relates to monomers and multimers of the polypeptides of the invention, their preparation, and compositions (preferably, Therapeutics) containing them. In specific embodiments, the polypeptides of the invention are monomers, dimers, trimers or tetramers. In additional embodiments, the multimers of the invention are at least dimers, at least trimers, or at least tetramers.

[195] Multimers encompassed by the invention may be homomers or heteromers. As used herein, the term homomer refers to a multimer containing only polypeptides corresponding to a protein of the invention (e.g., the amino acid sequence of SEQ ID NO:Y, an amino acid sequence encoded by SEQ ID NO:X or the complement of SEQ ID NO:X, the amino acid sequence encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or an amino acid sequence encoded by cDNA contained in Clone ID NO:Z (including fragments, variants, splice variants, and fusion proteins, corresponding to

these as described herein)). These homomers may contain polypeptides having identical or different amino acid sequences. In a specific embodiment, a homomer of the invention is a multimer containing only polypeptides having an identical amino acid sequence. In another specific embodiment, a homomer of the invention is a multimer containing polypeptides having different amino acid sequences. In specific embodiments, the multimer of the invention is a homodimer (e.g., containing two polypeptides having identical or different amino acid sequences) or a homotrimer (e.g., containing three polypeptides having identical and/or different amino acid sequences). In additional embodiments, the homomeric multimer of the invention is at least a homodimer, at least a homotrimer, or at least a homotetramer.

[196] As used herein, the term heteromer refers to a multimer containing one or more heterologous polypeptides (i.e., polypeptides of different proteins) in addition to the polypeptides of the invention. In a specific embodiment, the multimer of the invention is a heterodimer, a heterotrimer, or a heterotetramer. In additional embodiments, the heteromeric multimer of the invention is at least a heterodimer, at least a heterotrimer, or at least a heterotetramer.

[197] Multimers of the invention may be the result of hydrophobic, hydrophilic, ionic and/or covalent associations and/or may be indirectly linked by, for example, liposome formation. Thus, in one embodiment, multimers of the invention, such as, for example, homodimers or homotrimers, are formed when polypeptides of the invention contact one another in solution. In another embodiment, heteromultimers of the invention, such as, for example, heterotrimers or heterotetramers, are formed when polypeptides of the invention contact antibodies to the polypeptides of the invention (including antibodies to the heterologous polypeptide sequence in a fusion protein of the invention) in solution. In other embodiments, multimers of the invention are formed by covalent associations with and/or between the polypeptides of the invention. Such covalent associations may involve one or more amino acid residues contained in the polypeptide sequence (e.g., that recited in SEQ ID NO:Y, encoded by the portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or encoded by the cDNA contained in Clone ID NO:Z). In one instance, the covalent associations are cross-linking between cysteine residues located within the polypeptide sequences which interact in the native (i.e., naturally occurring) polypeptide. In another instance, the covalent associations are the consequence of chemical or recombinant manipulation. Alternatively, such covalent associations may involve one or more amino

acid residues contained in the heterologous polypeptide sequence in a fusion protein. In one example, covalent associations are between the heterologous sequence contained in a fusion protein of the invention (see, e.g., US Patent Number 5,478,925). In a specific example, the covalent associations are between the heterologous sequence contained in a Fc fusion protein of the invention (as described herein). In another specific example, covalent associations of fusion proteins of the invention are between heterologous polypeptide sequence from another protein that is capable of forming covalently associated multimers, such as for example, osteoprotegerin (see, e.g., International Publication NO: WO 98/49305, the contents of which are herein incorporated by reference in its entirety). In another embodiment, two or more polypeptides of the invention are joined through peptide linkers. Examples include those peptide linkers described in U.S. Pat. No. 5,073,627 (hereby incorporated by reference). Proteins comprising multiple polypeptides of the invention separated by peptide linkers may be produced using conventional recombinant DNA technology.

[198] Another method for preparing multimer polypeptides of the invention involves use of polypeptides of the invention fused to a leucine zipper or isoleucine zipper polypeptide sequence. Leucine zipper and isoleucine zipper domains are polypeptides that promote multimerization of the proteins in which they are found. Leucine zippers were originally identified in several DNA-binding proteins (Landschulz et al., Science 240:1759, (1988)), and have since been found in a variety of different proteins. Among the known leucine zippers are naturally occurring peptides and derivatives thereof that dimerize or trimerize. Examples of leucine zipper domains suitable for producing soluble multimeric proteins of the invention are those described in PCT application WO 94/10308, hereby incorporated by reference. Recombinant fusion proteins comprising a polypeptide of the invention fused to a polypeptide sequence that dimerizes or trimerizes in solution are expressed in suitable host cells, and the resulting soluble multimeric fusion protein is recovered from the culture supernatant using techniques known in the art.

[199] Trimeric polypeptides of the invention may offer the advantage of enhanced biological activity. Preferred leucine zipper moieties and isoleucine moieties are those that preferentially form trimers. One example is a leucine zipper derived from lung surfactant protein D (SPD), as described in Hoppe et al. (FEBS Letters 344:191, (1994)) and in U.S. patent application Ser. No. 08/446,922, hereby incorporated by reference. Other peptides

derived from naturally occurring trimeric proteins may be employed in preparing trimeric polypeptides of the invention.

[200] In another example, proteins of the invention are associated by interactions between Flag® polypeptide sequence contained in fusion proteins of the invention containing Flag® polypeptide sequence. In a further embodiment, proteins of the invention are associated by interactions between heterologous polypeptide sequence contained in Flag® fusion proteins of the invention and anti-Flag® antibody.

[201] The multimers of the invention may be generated using chemical techniques known in the art. For example, polypeptides desired to be contained in the multimers of the invention may be chemically cross-linked using linker molecules and linker molecule length optimization techniques known in the art (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). Additionally, multimers of the invention may be generated using techniques known in the art to form one or more inter-molecule cross-links between the cysteine residues located within the sequence of the polypeptides desired to be contained in the multimer (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). Further, polypeptides of the invention may be routinely modified by the addition of cysteine or biotin to the C-terminus or N-terminus of the polypeptide and techniques known in the art may be applied to generate multimers containing one or more of these modified polypeptides (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). Additionally, techniques known in the art may be applied to generate liposomes containing the polypeptide components desired to be contained in the multimer of the invention (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety).

[202] Alternatively, multimers of the invention may be generated using genetic engineering techniques known in the art. In one embodiment, polypeptides contained in multimers of the invention are produced recombinantly using fusion protein technology described herein or otherwise known in the art (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). In a specific embodiment, polynucleotides coding for a homodimer of the invention are generated by ligating a polynucleotide sequence encoding a polypeptide of the invention to a sequence encoding a linker polypeptide and then further to a synthetic polynucleotide encoding the translated product of the polypeptide in the reverse orientation from the original C-terminus to the N-

terminus (lacking the leader sequence) (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety). In another embodiment, recombinant techniques described herein or otherwise known in the art are applied to generate recombinant polypeptides of the invention which contain a transmembrane domain (or hydrophobic or signal peptide) and which can be incorporated by membrane reconstitution techniques into liposomes (see, e.g., US Patent Number 5,478,925, which is herein incorporated by reference in its entirety).

Antibodies

[203] Further polypeptides of the invention relate to antibodies and T-cell antigen receptors (TCR) which immunospecifically bind a polypeptide, polypeptide fragment, or variant of the invention (e.g., a polypeptide or fragment or variant of the amino acid sequence of SEQ ID NO:Y or a polypeptide encoded by the cDNA contained in Clone ID No:Z, and/or an epitope, of the present invention) as determined by immunoassays well known in the art for assaying specific antibody-antigen binding. Antibodies of the invention include, but are not limited to, polyclonal, monoclonal, multispecific, human, humanized or chimeric antibodies, single chain antibodies, Fab fragments, F(ab') fragments, fragments produced by a Fab expression library, anti-idiotypic (anti-Id) antibodies (including, e.g., anti-Id antibodies to antibodies of the invention), intracellularly-made antibodies (i.e., intrabodies), and epitope-binding fragments of any of the above. The term "antibody," as used herein, refers to immunoglobulin molecules and immunologically active portions of immunoglobulin molecules, i.e., molecules that contain an antigen binding site that immunospecifically binds an antigen. The immunoglobulin molecules of the invention can be of any type (e.g., IgG, IgE, IgM, IgD, IgA and IgY), class (e.g., IgG1, IgG2, IgG3, IgG4, IgA1 and IgA2) or subclass of immunoglobulin molecule. In preferred embodiments, the immunoglobulin molecules of the invention are IgG1. In other preferred embodiments, the immunoglobulin molecules of the invention are IgG4.

[204] Most preferably the antibodies are human antigen-binding antibody fragments of the present invention and include, but are not limited to, Fab, Fab' and F(ab')₂, Fd, single-chain Fvs (scFv), single-chain antibodies, disulfide-linked Fvs (sdFv) and fragments comprising either a VL or VH domain. Antigen-binding antibody fragments, including single-chain antibodies, may comprise the variable region(s) alone or in combination with the entirety or a portion of the following: hinge region, CH1, CH2, and CH3 domains. Also

included in the invention are antigen-binding fragments also comprising any combination of variable region(s) with a hinge region, CH1, CH2, and CH3 domains. The antibodies of the invention may be from any animal origin including birds and mammals. Preferably, the antibodies are human, murine (e.g., mouse and rat), donkey, ship rabbit, goat, guinea pig, camel, horse, or chicken. As used herein, "human" antibodies include antibodies having the amino acid sequence of a human immunoglobulin and include antibodies isolated from human immunoglobulin libraries or from animals transgenic for one or more human immunoglobulin and that do not express endogenous immunoglobulins, as described infra and, for example in, U.S. Patent No. 5,939,598 by Kucherlapati et al.

[205] The antibodies of the present invention may be monospecific, bispecific, trispecific or of greater multispecificity. Multispecific antibodies may be specific for different epitopes of a polypeptide of the present invention or may be specific for both a polypeptide of the present invention as well as for a heterologous epitope, such as a heterologous polypeptide or solid support material. See, e.g., PCT publications WO 93/17715; WO 92/08802; WO 91/00360; WO 92/05793; Tutt, et al., J. Immunol. 147:60-69 (1991); U.S. Patent Nos. 4,474,893; 4,714,681; 4,925,648; 5,573,920; 5,601,819; Kostelny et al., J. Immunol. 148:1547-1553 (1992).

[206] Antibodies of the present invention may be described or specified in terms of the epitope(s) or portion(s) of a polypeptide of the present invention which they recognize or specifically bind. The epitope(s) or polypeptide portion(s) may be specified as described herein, e.g., by N-terminal and C-terminal positions, or by size in contiguous amino acid residues, or listed in the Tables and Figures. Preferred epitopes of the invention include the predicted epitopes shown in column 7 of Table 1A, as well as polynucleotides that encode these epitopes. Antibodies which specifically bind any epitope or polypeptide of the present invention may also be excluded. Therefore, the present invention includes antibodies that specifically bind polypeptides of the present invention, and allows for the exclusion of the same.

[207] Antibodies of the present invention may also be described or specified in terms of their cross-reactivity. Antibodies that do not bind any other analog, ortholog, or homolog of a polypeptide of the present invention are included. Antibodies that bind polypeptides with at least 95%, at least 90%, at least 85%, at least 80%, at least 75%, at least 70%, at least 65%, at least 60%, at least 55%, and at least 50% identity (as calculated using methods known in the art and described herein) to a polypeptide of the present invention are also

included in the present invention. In specific embodiments, antibodies of the present invention cross-react with murine, rat and/or rabbit homologs of human proteins and the corresponding epitopes thereof. Antibodies that do not bind polypeptides with less than 95%, less than 90%, less than 85%, less than 80%, less than 75%, less than 70%, less than 65%, less than 60%, less than 55%, and less than 50% identity (as calculated using methods known in the art and described herein) to a polypeptide of the present invention are also included in the present invention. In a specific embodiment, the above-described cross-reactivity is with respect to any single specific antigenic or immunogenic polypeptide, or combination(s) of 2, 3, 4, 5, or more of the specific antigenic and/or immunogenic polypeptides disclosed herein. Further included in the present invention are antibodies which bind polypeptides encoded by polynucleotides which hybridize to a polynucleotide of the present invention under stringent hybridization conditions (as described herein). Antibodies of the present invention may also be described or specified in terms of their binding affinity to a polypeptide of the invention. Preferred binding affinities include those with a dissociation constant or K_d less than 5×10^{-2} M, 10^{-2} M, 5×10^{-3} M, 10^{-3} M, 5×10^{-4} M, 10^{-4} M, 5×10^{-5} M, 10^{-5} M, 5×10^{-6} M, 10^{-6} M, 5×10^{-7} M, 10^{-7} M, 5×10^{-8} M, 10^{-8} M, 5×10^{-9} M, 10^{-9} M, 5×10^{-10} M, 10^{-10} M, 5×10^{-11} M, 10^{-11} M, 5×10^{-12} M, 10^{-12} M, 5×10^{-13} M, 10^{-13} M, 5×10^{-14} M, 10^{-14} M, 5×10^{-15} M, or 10^{-15} M.

[208] The invention also provides antibodies that competitively inhibit binding of an antibody to an epitope of the invention as determined by any method known in the art for determining competitive binding, for example, the immunoassays described herein. In preferred embodiments, the antibody competitively inhibits binding to the epitope by at least 95%, at least 90%, at least 85 %, at least 80%, at least 75%, at least 70%, at least 60%, or at least 50%.

[209] Antibodies of the present invention may act as agonists or antagonists of the polypeptides of the present invention. For example, the present invention includes antibodies which disrupt the receptor/ligand interactions with the polypeptides of the invention either partially or fully. Preferably, antibodies of the present invention bind an antigenic epitope disclosed herein, or a portion thereof. The invention features both receptor-specific antibodies and ligand-specific antibodies. The invention also features receptor-specific antibodies which do not prevent ligand binding but prevent receptor activation. Receptor activation (i.e., signaling) may be determined by techniques described herein or otherwise known in the art. For example, receptor activation can be determined

by detecting the phosphorylation (e.g., tyrosine or serine/threonine) of the receptor or its substrate by immunoprecipitation followed by western blot analysis (for example, as described *supra*). In specific embodiments, antibodies are provided that inhibit ligand activity or receptor activity by at least 95%, at least 90%, at least 85%, at least 80%, at least 75%, at least 70%, at least 60%, or at least 50% of the activity in absence of the antibody.

[210] The invention also features receptor-specific antibodies which both prevent ligand binding and receptor activation as well as antibodies that recognize the receptor-ligand complex, and, preferably, do not specifically recognize the unbound receptor or the unbound ligand. Likewise, included in the invention are neutralizing antibodies which bind the ligand and prevent binding of the ligand to the receptor, as well as antibodies which bind the ligand, thereby preventing receptor activation, but do not prevent the ligand from binding the receptor. Further included in the invention are antibodies which activate the receptor. These antibodies may act as receptor agonists, i.e., potentiate or activate either all or a subset of the biological activities of the ligand-mediated receptor activation, for example, by inducing dimerization of the receptor. The antibodies may be specified as agonists, antagonists or inverse agonists for biological activities comprising the specific biological activities of the peptides of the invention disclosed herein. The above antibody agonists can be made using methods known in the art. See, e.g., PCT publication WO 96/40281; U.S. Patent No. 5,811,097; Deng et al., *Blood* 92(6):1981-1988 (1998); Chen et al., *Cancer Res.* 58(16):3668-3678 (1998); Harrop et al., *J. Immunol.* 161(4):1786-1794 (1998); Zhu et al., *Cancer Res.* 58(15):3209-3214 (1998); Yoon et al., *J. Immunol.* 160(7):3170-3179 (1998); Prat et al., *J. Cell. Sci.* 111(Pt2):237-247 (1998); Pitard et al., *J. Immunol. Methods* 205(2):177-190 (1997); Liautard et al., *Cytokine* 9(4):233-241 (1997); Carlson et al., *J. Biol. Chem.* 272(17):11295-11301 (1997); Taryman et al., *Neuron* 14(4):755-762 (1995); Muller et al., *Structure* 6(9):1153-1167 (1998); Bartunek et al., *Cytokine* 8(1):14-20 (1996) (which are all incorporated by reference herein in their entireties).

[211] Antibodies of the present invention may be used, for example, to purify, detect, and target the polypeptides of the present invention, including both *in vitro* and *in vivo* diagnostic and therapeutic methods. For example, the antibodies have utility in immunoassays for qualitatively and quantitatively measuring levels of the polypeptides of the present invention in biological samples. See, e.g., Harlow et al., *Antibodies: A*

Laboratory Manual, (Cold Spring Harbor Laboratory Press, 2nd ed. 1988); incorporated by reference herein in its entirety.

[212] As discussed in more detail below, the antibodies of the present invention may be used either alone or in combination with other compositions. The antibodies may further be recombinantly fused to a heterologous polypeptide at the N- or C-terminus or chemically conjugated (including covalent and non-covalent conjugations) to polypeptides or other compositions. For example, antibodies of the present invention may be recombinantly fused or conjugated to molecules useful as labels in detection assays and effector molecules such as heterologous polypeptides, drugs, radionuclides, or toxins. See, e.g., PCT publications WO 92/08495; WO 91/14438; WO 89/12624; U.S. Patent No. 5,314,995; and EP 396,387; the disclosures of which are incorporated herein by reference in their entireties.

[213] The antibodies of the invention include derivatives that are modified, i.e., by the covalent attachment of any type of molecule to the antibody such that covalent attachment does not prevent the antibody from generating an anti-idiotypic response. For example, but not by way of limitation, the antibody derivatives include antibodies that have been modified, e.g., by glycosylation, acetylation, pegylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to a cellular ligand or other protein, etc. Any of numerous chemical modifications may be carried out by known techniques, including, but not limited to specific chemical cleavage, acetylation, formylation, metabolic synthesis of tunicamycin, etc. Additionally, the derivative may contain one or more non-classical amino acids.

[214] The antibodies of the present invention may be generated by any suitable method known in the art. Polyclonal antibodies to an antigen-of-interest can be produced by various procedures well known in the art. For example, a polypeptide of the invention can be administered to various host animals including, but not limited to, rabbits, mice, rats, etc. to induce the production of sera containing polyclonal antibodies specific for the antigen. Various adjuvants may be used to increase the immunological response, depending on the host species, and include but are not limited to, Freund's (complete and incomplete), mineral gels such as aluminum hydroxide, surface active substances such as lysolecithin, pluronic polyols, polyanions, peptides, oil emulsions, keyhole limpet hemocyanins, dinitrophenol, and potentially useful human adjuvants such as BCG (bacille Calmette-Guerin) and corynebacterium parvum. Such adjuvants are also well known in the art.

[215] Monoclonal antibodies can be prepared using a wide variety of techniques known in the art including the use of hybridoma, recombinant, and phage display technologies, or a combination thereof. For example, monoclonal antibodies can be produced using hybridoma techniques including those known in the art and taught, for example, in Harlow et al., *Antibodies: A Laboratory Manual*, (Cold Spring Harbor Laboratory Press, 2nd ed. 1988); Hammerling, et al., in: *Monoclonal Antibodies and T-Cell Hybridomas* 563-681 (Elsevier, N.Y., 1981) (said references incorporated by reference in their entireties). The term “monoclonal antibody” as used herein is not limited to antibodies produced through hybridoma technology. The term “monoclonal antibody” refers to an antibody that is derived from a single clone, including any eukaryotic, prokaryotic, or phage clone, and not the method by which it is produced.

[216] Methods for producing and screening for specific antibodies using hybridoma technology are routine and well known in the art and are discussed in detail in the Examples. In a non-limiting example, mice can be immunized with a polypeptide of the invention or a cell expressing such peptide. Once an immune response is detected, e.g., antibodies specific for the antigen are detected in the mouse serum, the mouse spleen is harvested and splenocytes isolated. The splenocytes are then fused by well known techniques to any suitable myeloma cells, for example cells from cell line SP20 available from the ATCC. Hybridomas are selected and cloned by limited dilution. The hybridoma clones are then assayed by methods known in the art for cells that secrete antibodies capable of binding a polypeptide of the invention. Ascites fluid, which generally contains high levels of antibodies, can be generated by immunizing mice with positive hybridoma clones.

[217] Accordingly, the present invention provides methods of generating monoclonal antibodies as well as antibodies produced by the method comprising culturing a hybridoma cell secreting an antibody of the invention wherein, preferably, the hybridoma is generated by fusing splenocytes isolated from a mouse immunized with an antigen of the invention with myeloma cells and then screening the hybridomas resulting from the fusion for hybridoma clones that secrete an antibody able to bind a polypeptide of the invention.

[218] Another well known method for producing both polyclonal and monoclonal human B cell lines is transformation using Epstein Barr Virus (EBV). Protocols for generating EBV-transformed B cell lines are commonly known in the art, such as, for example, the protocol outlined in Chapter 7.22 of *Current Protocols in Immunology*,

Coligan et al., Eds., 1994, John Wiley & Sons, NY, which is hereby incorporated in its entirety by reference. The source of B cells for transformation is commonly human peripheral blood, but B cells for transformation may also be derived from other sources including, but not limited to, lymph nodes, tonsil, spleen, tumor tissue, and infected tissues. Tissues are generally made into single cell suspensions prior to EBV transformation. Additionally, steps may be taken to either physically remove or inactivate T cells (e.g., by treatment with cyclosporin A) in B cell-containing samples, because T cells from individuals seropositive for anti-EBV antibodies can suppress B cell immortalization by EBV.

[219] In general, the sample containing human B cells is innoculated with EBV, and cultured for 3-4 weeks. A typical source of EBV is the culture supernatant of the B95-8 cell line (ATCC #VR-1492). Physical signs of EBV transformation can generally be seen towards the end of the 3-4 week culture period. By phase-contrast microscopy, transformed cells may appear large, clear, hairy and tend to aggregate in tight clusters of cells. Initially, EBV lines are generally polyclonal. However, over prolonged periods of cell cultures, EBV lines may become monoclonal or polyclonal as a result of the selective outgrowth of particular B cell clones. Alternatively, polyclonal EBV transformed lines may be subcloned (e.g., by limiting dilution culture) or fused with a suitable fusion partner and plated at limiting dilution to obtain monoclonal B cell lines. Suitable fusion partners for EBV transformed cell lines include mouse myeloma cell lines (e.g., SP2/0, X63-Ag8.653), heteromyeloma cell lines (human x mouse; e.g., SPAM-8, SBC-H20, and CB-F7), and human cell lines (e.g., GM 1500, SKO-007, RPMI 8226, and KR-4). Thus, the present invention also provides a method of generating polyclonal or monoclonal human antibodies against polypeptides of the invention or fragments thereof, comprising EBV-transformation of human B cells.

[220] Antibody fragments which recognize specific epitopes may be generated by known techniques. For example, Fab and F(ab')₂ fragments of the invention may be produced by proteolytic cleavage of immunoglobulin molecules, using enzymes such as papain (to produce Fab fragments) or pepsin (to produce F(ab')₂ fragments). F(ab')₂ fragments contain the variable region, the light chain constant region and the CH1 domain of the heavy chain.

[221] For example, the antibodies of the present invention can also be generated using various phage display methods known in the art. In phage display methods, functional

antibody domains are displayed on the surface of phage particles which carry the polynucleotide sequences encoding them. In a particular embodiment, such phage can be utilized to display antigen binding domains expressed from a repertoire or combinatorial antibody library (e.g., human or murine). Phage expressing an antigen binding domain that binds the antigen of interest can be selected or identified with antigen, e.g., using labeled antigen or antigen bound or captured to a solid surface or bead. Phage used in these methods are typically filamentous phage including fd and M13 binding domains expressed from phage with Fab, Fv or disulfide stabilized Fv antibody domains recombinantly fused to either the phage gene III or gene VIII protein. Examples of phage display methods that can be used to make the antibodies of the present invention include those disclosed in Brinkman et al., J. Immunol. Methods 182:41-50 (1995); Ames et al., J. Immunol. Methods 184:177-186 (1995); Kettleborough et al., Eur. J. Immunol. 24:952-958 (1994); Persic et al., Gene 187 9-18 (1997); Burton et al., Advances in Immunology 57:191-280 (1994); PCT application No. PCT/GB91/01134; PCT publications WO 90/02809; WO 91/10737; WO 92/01047; WO 92/18619; WO 93/11236; WO 95/15982; WO 95/20401; and U.S. Patent Nos. 5,698,426; 5,223,409; 5,403,484; 5,580,717; 5,427,908; 5,750,753; 5,821,047; 5,571,698; 5,427,908; 5,516,637; 5,780,225; 5,658,727; 5,733,743 and 5,969,108; each of which is incorporated herein by reference in its entirety.

[222] As described in the above references, after phage selection, the antibody coding regions from the phage can be isolated and used to generate whole antibodies, including human antibodies, or any other desired antigen binding fragment, and expressed in any desired host, including mammalian cells, insect cells, plant cells, yeast, and bacteria, e.g., as described in detail below. For example, techniques to recombinantly produce Fab, Fab' and F(ab')₂ fragments can also be employed using methods known in the art such as those disclosed in PCT publication WO 92/22324; Mullinax et al., BioTechniques 12(6):864-869 (1992); and Sawai et al., AJRI 34:26-34 (1995); and Better et al., Science 240:1041-1043 (1988) (said references incorporated by reference in their entireties).

[223] Examples of techniques which can be used to produce single-chain Fvs and antibodies include those described in U.S. Patents 4,946,778 and 5,258,498; Huston et al., Methods in Enzymology 203:46-88 (1991); Shu et al., PNAS 90:7995-7999 (1993); and Skerra et al., Science 240:1038-1040 (1988). For some uses, including *in vivo* use of antibodies in humans and *in vitro* detection assays, it may be preferable to use chimeric, humanized, or human antibodies. A chimeric antibody is a molecule in which different

portions of the antibody are derived from different animal species, such as antibodies having a variable region derived from a murine monoclonal antibody and a human immunoglobulin constant region. Methods for producing chimeric antibodies are known in the art. See e.g., Morrison, *Science* 229:1202 (1985); Oi et al., *BioTechniques* 4:214 (1986); Gillies et al., (1989) *J. Immunol. Methods* 125:191-202; U.S. Patent Nos. 5,807,715; 4,816,567; and 4,816,397, which are incorporated herein by reference in their entirety. Humanized antibodies are antibody molecules from non-human species antibody that binds the desired antigen having one or more complementarity determining regions (CDRs) from the non-human species and a framework regions from a human immunoglobulin molecule. Often, framework residues in the human framework regions will be substituted with the corresponding residue from the CDR donor antibody to alter, preferably improve, antigen binding. These framework substitutions are identified by methods well known in the art, e.g., by modeling of the interactions of the CDR and framework residues to identify framework residues important for antigen binding and sequence comparison to identify unusual framework residues at particular positions. (See, e.g., Queen et al., U.S. Patent No. 5,585,089; Riechmann et al., *Nature* 332:323 (1988), which are incorporated herein by reference in their entirety.) Antibodies can be humanized using a variety of techniques known in the art including, for example, CDR-grafting (EP 239,400; PCT publication WO 91/09967; U.S. Patent Nos. 5,225,539; 5,530,101; and 5,585,089), veneering or resurfacing (EP 592,106; EP 519,596; Padlan, *Molecular Immunology* 28(4/5):489-498 (1991); Studnicka et al., *Protein Engineering* 7(6):805-814 (1994); Roguska et al., *PNAS* 91:969-973 (1994)), and chain shuffling (U.S. Patent No. 5,565,332).

[224] Completely human antibodies are particularly desirable for therapeutic treatment of human patients. Human antibodies can be made by a variety of methods known in the art including phage display methods described above using antibody libraries derived from human immunoglobulin sequences. See also, U.S. Patent Nos. 4,444,887 and 4,716,111; and PCT publications WO 98/46645, WO 98/50433, WO 98/24893, WO 98/16654, WO 96/34096, WO 96/33735, and WO 91/10741; each of which is incorporated herein by reference in its entirety.

[225] Human antibodies can also be produced using transgenic mice which are incapable of expressing functional endogenous immunoglobulins, but which can express human immunoglobulin genes. For example, the human heavy and light chain

immunoglobulin gene complexes may be introduced randomly or by homologous recombination into mouse embryonic stem cells. Alternatively, the human variable region, constant region, and diversity region may be introduced into mouse embryonic stem cells in addition to the human heavy and light chain genes. The mouse heavy and light chain immunoglobulin genes may be rendered non-functional separately or simultaneously with the introduction of human immunoglobulin loci by homologous recombination. In particular, homozygous deletion of the JH region prevents endogenous antibody production. The modified embryonic stem cells are expanded and microinjected into blastocysts to produce chimeric mice. The chimeric mice are then bred to produce homozygous offspring which express human antibodies. The transgenic mice are immunized in the normal fashion with a selected antigen, e.g., all or a portion of a polypeptide of the invention. Monoclonal antibodies directed against the antigen can be obtained from the immunized, transgenic mice using conventional hybridoma technology. The human immunoglobulin transgenes harbored by the transgenic mice rearrange during B cell differentiation, and subsequently undergo class switching and somatic mutation. Thus, using such a technique, it is possible to produce therapeutically useful IgG, IgA, IgM and IgE antibodies. For an overview of this technology for producing human antibodies, see Lonberg and Huszar, *Int. Rev. Immunol.* 13:65-93 (1995). For a detailed discussion of this technology for producing human antibodies and human monoclonal antibodies and protocols for producing such antibodies, see, e.g., PCT publications WO 98/24893; WO 92/01047; WO 96/34096; WO 96/33735; European Patent No. 0 598 877; U.S. Patent Nos. 5,413,923; 5,625,126; 5,633,425; 5,569,825; 5,661,016; 5,545,806; 5,814,318; 5,885,793; 5,916,771; 5,939,598; 6,075,181; and 6,114,598, which are incorporated by reference herein in their entirety. In addition, companies such as Abgenix, Inc. (Freemont, CA) and Genpharm (San Jose, CA) can be engaged to provide human antibodies directed against a selected antigen using technology similar to that described above.

[226] Completely human antibodies which recognize a selected epitope can be generated using a technique referred to as "guided selection." In this approach a selected non-human monoclonal antibody, e.g., a mouse antibody, is used to guide the selection of a completely human antibody recognizing the same epitope. (Jespers et al., *Bio/technology* 12:899-903 (1988)).

[227] Further, antibodies to the polypeptides of the invention can, in turn, be utilized to generate anti-idiotypic antibodies that "mimic" polypeptides of the invention using

techniques well known to those skilled in the art. (See, e.g., Greenspan & Bona, FASEB J. 7(5):437-444; (1989) and Nissinoff, J. Immunol. 147(8):2429-2438 (1991)). For example, antibodies which bind to and competitively inhibit polypeptide multimerization and/or binding of a polypeptide of the invention to a ligand can be used to generate anti-idiotypes that "mimic" the polypeptide multimerization and/or binding domain and, as a consequence, bind to and neutralize polypeptide and/or its ligand. Such neutralizing anti-idiotypes or Fab fragments of such anti-idiotypes can be used in therapeutic regimens to neutralize polypeptide ligand(s)/receptor(s). For example, such anti-idiotypic antibodies can be used to bind a polypeptide of the invention and/or to bind its ligand(s)/receptor(s), and thereby block its biological activity. Alternatively, antibodies which bind to and enhance polypeptide multimerization and/or binding, and/or receptor/ligand multimerization, binding and/or signaling can be used to generate anti-idiotypes that function as agonists of a polypeptide of the invention and/or its ligand/receptor. Such agonistic anti-idiotypes or Fab fragments of such anti-idiotypes can be used in therapeutic regimens as agonists of the polypeptides of the invention or its ligand(s)/receptor(s). For example, such anti-idiotypic antibodies can be used to bind a polypeptide of the invention and/or to bind its ligand(s)/receptor(s), and thereby promote or enhance its biological activity.

[228] Intrabodies of the invention can be produced using methods known in the art, such as those disclosed and reviewed in Chen et al., Hum. Gene Ther. 5:595-601 (1994); Marasco, W.A., Gene Ther. 4:11-15 (1997); Rondon and Marasco, Annu. Rev. Microbiol. 51:257-283 (1997); Proba et al., J. Mol. Biol. 275:245-253 (1998); Cohen et al., Oncogene 17:2445-2456 (1998); Ohage and Steipe, J. Mol. Biol. 291:1119-1128 (1999); Ohage et al., J. Mol. Biol. 291:1129-1134 (1999); Wirtz and Steipe, Protein Sci. 8:2245-2250 (1999); Zhu et al., J. Immunol. Methods 231:207-222 (1999); and references cited therein.

Polynucleotides Encoding Antibodies

[229] The invention further provides polynucleotides comprising a nucleotide sequence encoding an antibody of the invention and fragments thereof. The invention also encompasses polynucleotides that hybridize under stringent or alternatively, under lower stringency hybridization conditions, e.g., as defined *supra*, to polynucleotides that encode an antibody, preferably, that specifically binds to a polypeptide of the invention, preferably, an antibody that binds to a polypeptide having the amino acid sequence of SEQ ID NO:Y,

to a polypeptide encoded by a portion of SEQ ID NO:X as defined in columns 8 and 9 of Table 2, and/or to a polypeptide encoded by the cDNA contained in Clone ID NO:Z.

[230] The polynucleotides may be obtained, and the nucleotide sequence of the polynucleotides determined, by any method known in the art. For example, if the nucleotide sequence of the antibody is known, a polynucleotide encoding the antibody may be assembled from chemically synthesized oligonucleotides (e.g., as described in Kutmeier et al., *BioTechniques* 17:242 (1994)), which, briefly, involves the synthesis of overlapping oligonucleotides containing portions of the sequence encoding the antibody, annealing and ligating of those oligonucleotides, and then amplification of the ligated oligonucleotides by PCR.

[231] Alternatively, a polynucleotide encoding an antibody may be generated from nucleic acid from a suitable source. If a clone containing a nucleic acid encoding a particular antibody is not available, but the sequence of the antibody molecule is known, a nucleic acid encoding the immunoglobulin may be chemically synthesized or obtained from a suitable source (e.g., an antibody cDNA library, or a cDNA library generated from, or nucleic acid, preferably poly A+ RNA, isolated from, any tissue or cells expressing the antibody, such as hybridoma cells selected to express an antibody of the invention) by PCR amplification using synthetic primers hybridizable to the 3' and 5' ends of the sequence or by cloning using an oligonucleotide probe specific for the particular gene sequence to identify, e.g., a cDNA clone from a cDNA library that encodes the antibody. Amplified nucleic acids generated by PCR may then be cloned into replicable cloning vectors using any method well known in the art.

[232] Once the nucleotide sequence and corresponding amino acid sequence of the antibody is determined, the nucleotide sequence of the antibody may be manipulated using methods well known in the art for the manipulation of nucleotide sequences, e.g., recombinant DNA techniques, site directed mutagenesis, PCR, etc. (see, for example, the techniques described in Sambrook et al., 1990, *Molecular Cloning, A Laboratory Manual*, 2d Ed., Cold Spring Harbor Laboratory, Cold Spring Harbor, NY and Ausubel et al., eds., 1998, *Current Protocols in Molecular Biology*, John Wiley & Sons, NY, which are both incorporated by reference herein in their entireties), to generate antibodies having a different amino acid sequence, for example to create amino acid substitutions, deletions, and/or insertions.

[233] In a specific embodiment, the amino acid sequence of the heavy and/or light chain variable domains may be inspected to identify the sequences of the complementarity determining regions (CDRs) by methods that are well known in the art, e.g., by comparison to known amino acid sequences of other heavy and light chain variable regions to determine the regions of sequence hypervariability. Using routine recombinant DNA techniques, one or more of the CDRs may be inserted within framework regions, e.g., into human framework regions to humanize a non-human antibody, as described *supra*. The framework regions may be naturally occurring or consensus framework regions, and preferably human framework regions (see, e.g., Chothia et al., J. Mol. Biol. 278: 457-479 (1998) for a listing of human framework regions). Preferably, the polynucleotide generated by the combination of the framework regions and CDRs encodes an antibody that specifically binds a polypeptide of the invention. Preferably, as discussed *supra*, one or more amino acid substitutions may be made within the framework regions, and, preferably, the amino acid substitutions improve binding of the antibody to its antigen. Additionally, such methods may be used to make amino acid substitutions or deletions of one or more variable region cysteine residues participating in an intrachain disulfide bond to generate antibody molecules lacking one or more intrachain disulfide bonds. Other alterations to the polynucleotide are encompassed by the present invention and within the skill of the art.

[234] In addition, techniques developed for the production of "chimeric antibodies" (Morrison et al., Proc. Natl. Acad. Sci. 81:851-855 (1984); Neuberger et al., Nature 312:604-608 (1984); Takeda et al., Nature 314:452-454 (1985)) by splicing genes from a mouse antibody molecule of appropriate antigen specificity together with genes from a human antibody molecule of appropriate biological activity can be used. As described *supra*, a chimeric antibody is a molecule in which different portions are derived from different animal species, such as those having a variable region derived from a murine mAb and a human immunoglobulin constant region, e.g., humanized antibodies.

[235] Alternatively, techniques described for the production of single chain antibodies (U.S. Patent No. 4,946,778; Bird, Science 242:423-42 (1988); Huston et al., Proc. Natl. Acad. Sci. USA 85:5879-5883 (1988); and Ward et al., Nature 334:544-54 (1989)) can be adapted to produce single chain antibodies. Single chain antibodies are formed by linking the heavy and light chain fragments of the Fv region via an amino acid bridge, resulting in a single chain polypeptide. Techniques for the assembly of functional Fv fragments in *E. coli* may also be used (Skerra et al., Science 242:1038-1041 (1988)).

Methods of Producing Antibodies

[236] The antibodies of the invention can be produced by any method known in the art for the synthesis of antibodies, in particular, by chemical synthesis or preferably, by recombinant expression techniques. Methods of producing antibodies include, but are not limited to, hybridoma technology, EBV transformation, and other methods discussed herein as well as through the use recombinant DNA technology, as discussed below.

[237] Recombinant expression of an antibody of the invention, or fragment, derivative or analog thereof, (e.g., a heavy or light chain of an antibody of the invention or a single chain antibody of the invention), requires construction of an expression vector containing a polynucleotide that encodes the antibody. Once a polynucleotide encoding an antibody molecule or a heavy or light chain of an antibody, or portion thereof (preferably containing the heavy or light chain variable domain), of the invention has been obtained, the vector for the production of the antibody molecule may be produced by recombinant DNA technology using techniques well known in the art. Thus, methods for preparing a protein by expressing a polynucleotide containing an antibody encoding nucleotide sequence are described herein. Methods which are well known to those skilled in the art can be used to construct expression vectors containing antibody coding sequences and appropriate transcriptional and translational control signals. These methods include, for example, in vitro recombinant DNA techniques, synthetic techniques, and *in vivo* genetic recombination. The invention, thus, provides replicable vectors comprising a nucleotide sequence encoding an antibody molecule of the invention, or a heavy or light chain thereof, or a heavy or light chain variable domain, operably linked to a promoter. Such vectors may include the nucleotide sequence encoding the constant region of the antibody molecule (see, e.g., PCT Publication WO 86/05807; PCT Publication WO 89/01036; and U.S. Patent No. 5,122,464) and the variable domain of the antibody may be cloned into such a vector for expression of the entire heavy or light chain.

[238] The expression vector is transferred to a host cell by conventional techniques and the transfected cells are then cultured by conventional techniques to produce an antibody of the invention. Thus, the invention includes host cells containing a polynucleotide encoding an antibody of the invention, or a heavy or light chain thereof, or a single chain antibody of the invention, operably linked to a heterologous promoter. In preferred embodiments for the expression of double-chained antibodies, vectors encoding both the heavy and light

chains may be co-expressed in the host cell for expression of the entire immunoglobulin molecule, as detailed below.

[239] A variety of host-expression vector systems may be utilized to express the antibody molecules of the invention. Such host-expression systems represent vehicles by which the coding sequences of interest may be produced and subsequently purified, but also represent cells which may, when transformed or transfected with the appropriate nucleotide coding sequences, express an antibody molecule of the invention in situ. These include but are not limited to microorganisms such as bacteria (e.g., *E. coli*, *B. subtilis*) transformed with recombinant bacteriophage DNA, plasmid DNA or cosmid DNA expression vectors containing antibody coding sequences; yeast (e.g., *Saccharomyces*, *Pichia*) transformed with recombinant yeast expression vectors containing antibody coding sequences; insect cell systems infected with recombinant virus expression vectors (e.g., baculovirus) containing antibody coding sequences; plant cell systems infected with recombinant virus expression vectors (e.g., cauliflower mosaic virus, CaMV; tobacco mosaic virus, TMV) or transformed with recombinant plasmid expression vectors (e.g., Ti plasmid) containing antibody coding sequences; or mammalian cell systems (e.g., COS, CHO, BHK, 293, 3T3 cells) harboring recombinant expression constructs containing promoters derived from the genome of mammalian cells (e.g., metallothionein promoter) or from mammalian viruses (e.g., the adenovirus late promoter; the vaccinia virus 7.5K promoter). Preferably, bacterial cells such as *Escherichia coli*, and more preferably, eukaryotic cells, especially for the expression of whole recombinant antibody molecule, are used for the expression of a recombinant antibody molecule. For example, mammalian cells such as Chinese hamster ovary cells (CHO), in conjunction with a vector such as the major intermediate early gene promoter element from human cytomegalovirus is an effective expression system for antibodies (Foecking et al., *Gene* 45:101 (1986); Cockett et al., *Bio/Technology* 8:2 (1990)).

[240] In bacterial systems, a number of expression vectors may be advantageously selected depending upon the use intended for the antibody molecule being expressed. For example, when a large quantity of such a protein is to be produced, for the generation of pharmaceutical compositions of an antibody molecule, vectors which direct the expression of high levels of fusion protein products that are readily purified may be desirable. Such vectors include, but are not limited, to the *E. coli* expression vector pUR278 (Ruther et al., *EMBO J.* 2:1791 (1983)), in which the antibody coding sequence may be ligated

individually into the vector in frame with the lac Z coding region so that a fusion protein is produced; pIN vectors (Inouye & Inouye, Nucleic Acids Res. 13:3101-3109 (1985); Van Heeke & Schuster, J. Biol. Chem. 24:5503-5509 (1989)); and the like. pGEX vectors may also be used to express foreign polypeptides as fusion proteins with glutathione S-transferase (GST). In general, such fusion proteins are soluble and can easily be purified from lysed cells by adsorption and binding to matrix glutathione-agarose beads followed by elution in the presence of free glutathione. The pGEX vectors are designed to include thrombin or factor Xa protease cleavage sites so that the cloned target gene product can be released from the GST moiety.

[241] In an insect system, Autographa californica nuclear polyhedrosis virus (AcNPV) is used as a vector to express foreign genes. The virus grows in *Spodoptera frugiperda* cells. The antibody coding sequence may be cloned individually into non-essential regions (for example the polyhedrin gene) of the virus and placed under control of an AcNPV promoter (for example the polyhedrin promoter).

[242] In mammalian host cells, a number of viral-based expression systems may be utilized. In cases where an adenovirus is used as an expression vector, the antibody coding sequence of interest may be ligated to an adenovirus transcription/translation control complex, e.g., the late promoter and tripartite leader sequence. This chimeric gene may then be inserted in the adenovirus genome by *in vitro* or *in vivo* recombination. Insertion in a non-essential region of the viral genome (e.g., region E1 or E3) will result in a recombinant virus that is viable and capable of expressing the antibody molecule in infected hosts. (e.g., see Logan & Shenk, Proc. Natl. Acad. Sci. USA 81:355-359 (1984)). Specific initiation signals may also be required for efficient translation of inserted antibody coding sequences. These signals include the ATG initiation codon and adjacent sequences. Furthermore, the initiation codon must be in phase with the reading frame of the desired coding sequence to ensure translation of the entire insert. These exogenous translational control signals and initiation codons can be of a variety of origins, both natural and synthetic. The efficiency of expression may be enhanced by the inclusion of appropriate transcription enhancer elements, transcription terminators, etc. (see Bittner et al., Methods in Enzymol. 153:51-544 (1987)).

[243] In addition, a host cell strain may be chosen which modulates the expression of the inserted sequences, or modifies and processes the gene product in the specific fashion desired. Such modifications (e.g., glycosylation) and processing (e.g., cleavage) of protein

products may be important for the function of the protein. Different host cells have characteristic and specific mechanisms for the post-translational processing and modification of proteins and gene products. Appropriate cell lines or host systems can be chosen to ensure the correct modification and processing of the foreign protein expressed. To this end, eukaryotic host cells which possess the cellular machinery for proper processing of the primary transcript, glycosylation, and phosphorylation of the gene product may be used. Such mammalian host cells include but are not limited to CHO, VERY, BHK, Hela, COS, MDCK, 293, 3T3, WI38, and in particular, breast cancer cell lines such as, for example, BT483, Hs578T, HTB2, BT20 and T47D, and normal mammary gland cell line such as, for example, CRL7030 and Hs578Bst.

[244] For long-term, high-yield production of recombinant proteins, stable expression is preferred. For example, cell lines which stably express the antibody molecule may be engineered. Rather than using expression vectors which contain viral origins of replication, host cells can be transformed with DNA controlled by appropriate expression control elements (e.g., promoter, enhancer, sequences, transcription terminators, polyadenylation sites, etc.), and a selectable marker. Following the introduction of the foreign DNA, engineered cells may be allowed to grow for 1-2 days in an enriched media, and then are switched to a selective media. The selectable marker in the recombinant plasmid confers resistance to the selection and allows cells to stably integrate the plasmid into their chromosomes and grow to form foci which in turn can be cloned and expanded into cell lines. This method may advantageously be used to engineer cell lines which express the antibody molecule. Such engineered cell lines may be particularly useful in screening and evaluation of compounds that interact directly or indirectly with the antibody molecule.

[245] A number of selection systems may be used, including but not limited to the herpes simplex virus thymidine kinase (Wigler et al., Cell 11:223 (1977)), hypoxanthine-guanine phosphoribosyltransferase (Szybalska & Szybalski, Proc. Natl. Acad. Sci. USA 48:202 (1992)), and adenine phosphoribosyltransferase (Lowy et al., Cell 22:817 (1980)) genes can be employed in tk-, hgprt- or aprt- cells, respectively. Also, antimetabolite resistance can be used as the basis of selection for the following genes: dhfr, which confers resistance to methotrexate (Wigler et al., Natl. Acad. Sci. USA 77:357 (1980); O'Hare et al., Proc. Natl. Acad. Sci. USA 78:1527 (1981)); gpt, which confers resistance to mycophenolic acid (Mulligan & Berg, Proc. Natl. Acad. Sci. USA 78:2072 (1981)); neo, which confers resistance to the aminoglycoside G-418 Clinical Pharmacy 12:488-505; Wu

and Wu, *Biotherapy* 3:87-95 (1991); Tolstoshev, *Ann. Rev. Pharmacol. Toxicol.* 32:573-596 (1993); Mulligan, *Science* 260:926-932 (1993); and Morgan and Anderson, *Ann. Rev. Biochem.* 62:191-217 (1993); May, 1993, *TIB TECH* 11(5):155-215 (1993)); and hyg^r, which confers resistance to hygromycin (Santerre et al., *Gene* 30:147 (1984)). Methods commonly known in the art of recombinant DNA technology may be routinely applied to select the desired recombinant clone, and such methods are described, for example, in Ausubel et al. (eds.), *Current Protocols in Molecular Biology*, John Wiley & Sons, NY (1993); Kriegler, *Gene Transfer and Expression, A Laboratory Manual*, Stockton Press, NY (1990); and in Chapters 12 and 13, Dracopoli et al. (eds), *Current Protocols in Human Genetics*, John Wiley & Sons, NY (1994); Colberre-Garapin et al., *J. Mol. Biol.* 150:1 (1981), which are incorporated by reference herein in their entireties.

[246] The expression levels of an antibody molecule can be increased by vector amplification (for a review, see Bebbington and Hentschel, *The use of vectors based on gene amplification for the expression of cloned genes in mammalian cells in DNA cloning*, Vol.3. (Academic Press, New York, 1987)). When a marker in the vector system expressing antibody is amplifiable, increase in the level of inhibitor present in culture of host cell will increase the number of copies of the marker gene. Since the amplified region is associated with the antibody gene, production of the antibody will also increase (Crouse et al., *Mol. Cell. Biol.* 3:257 (1983)).

[247] Vectors which use glutamine synthase (GS) or DHFR as the selectable markers can be amplified in the presence of the drugs methionine sulfoximine or methotrexate, respectively. An advantage of glutamine synthase based vectors are the availability of cell lines (e.g., the murine myeloma cell line, NS0) which are glutamine synthase negative. Glutamine synthase expression systems can also function in glutamine synthase expressing cells (e.g. Chinese Hamster Ovary (CHO) cells) by providing additional inhibitor to prevent the functioning of the endogenous gene. A glutamine synthase expression system and components thereof are detailed in PCT publications: WO87/04462; WO86/05807; WO89/01036; WO89/10404; and WO91/06657 which are incorporated in their entireties by reference herein. Additionally, glutamine synthase expression vectors that may be used according to the present invention are commercially available from suppliers, including, for example Lonza Biologics, Inc. (Portsmouth, NH). Expression and production of monoclonal antibodies using a GS expression system in murine myeloma cells is described

in Bebbington *et al.*, *Bio/technology* 10:169(1992) and in Biblia and Robinson *Biotechnol. Prog.* 11:1 (1995) which are incorporated in their entireties by reference herein.

[248] The host cell may be co-transfected with two expression vectors of the invention, the first vector encoding a heavy chain derived polypeptide and the second vector encoding a light chain derived polypeptide. The two vectors may contain identical selectable markers which enable equal expression of heavy and light chain polypeptides. Alternatively, a single vector may be used which encodes, and is capable of expressing, both heavy and light chain polypeptides. In such situations, the light chain should be placed before the heavy chain to avoid an excess of toxic free heavy chain (Proudfoot, *Nature* 322:52 (1986); Kohler, *Proc. Natl. Acad. Sci. USA* 77:2197 (1980)). The coding sequences for the heavy and light chains may comprise cDNA or genomic DNA.

[249] Once an antibody molecule of the invention has been produced by an animal, chemically synthesized, or recombinantly expressed, it may be purified by any method known in the art for purification of an immunoglobulin molecule, for example, by chromatography (e.g., ion exchange, affinity, particularly by affinity for the specific antigen after Protein A, and sizing column chromatography), centrifugation, differential solubility, or by any other standard technique for the purification of proteins. In addition, the antibodies of the present invention or fragments thereof can be fused to heterologous polypeptide sequences described herein or otherwise known in the art, to facilitate purification.

[250] The present invention encompasses antibodies recombinantly fused or chemically conjugated (including both covalently and non-covalently conjugations) to a polypeptide (or portion thereof, preferably at least 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100 amino acids of the polypeptide) of the present invention to generate fusion proteins. The fusion does not necessarily need to be direct, but may occur through linker sequences. The antibodies may be specific for antigens other than polypeptides (or portion thereof, preferably at least 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100 amino acids of the polypeptide) of the present invention. For example, antibodies may be used to target the polypeptides of the present invention to particular cell types, either *in vitro* or *in vivo*, by fusing or conjugating the polypeptides of the present invention to antibodies specific for particular cell surface receptors. Antibodies fused or conjugated to the polypeptides of the present invention may also be used in *in vitro* immunoassays and purification methods using methods known in the art. See e.g., Harbor *et al.*, *supra*, and PCT publication WO 93/21232; EP 439,095;

Naramura et al., Immunol. Lett. 39:91-99 (1994); U.S. Patent 5,474,981; Gillies et al., PNAS 89:1428-1432 (1992); Fell et al., J. Immunol. 146:2446-2452 (1991), which are incorporated by reference in their entireties.

[251] The present invention further includes compositions comprising the polypeptides of the present invention fused or conjugated to antibody domains other than the variable regions. For example, the polypeptides of the present invention may be fused or conjugated to an antibody Fc region, or portion thereof. The antibody portion fused to a polypeptide of the present invention may comprise the constant region, hinge region, CH1 domain, CH2 domain, and CH3 domain or any combination of whole domains or portions thereof. The polypeptides may also be fused or conjugated to the above antibody portions to form multimers. For example, Fc portions fused to the polypeptides of the present invention can form dimers through disulfide bonding between the Fc portions. Higher multimeric forms can be made by fusing the polypeptides to portions of IgA and IgM. Methods for fusing or conjugating the polypeptides of the present invention to antibody portions are known in the art. See, e.g., U.S. Patent Nos. 5,336,603; 5,622,929; 5,359,046; 5,349,053; 5,447,851; 5,112,946; EP 307,434; EP 367,166; PCT publications WO 96/04388; WO 91/06570; Ashkenazi et al., Proc. Natl. Acad. Sci. USA 88:10535-10539 (1991); Zheng et al., J. Immunol. 154:5590-5600 (1995); and Vil et al., Proc. Natl. Acad. Sci. USA 89:11337-11341 (1992) (said references incorporated by reference in their entireties).

[252] As discussed, *supra*, the polypeptides corresponding to a polypeptide, polypeptide fragment, or a variant of SEQ ID NO:Y may be fused or conjugated to the above antibody portions to increase the *in vivo* half life of the polypeptides or for use in immunoassays using methods known in the art. Further, the polypeptides corresponding to SEQ ID NO:Y may be fused or conjugated to the above antibody portions to facilitate purification. One reported example describes chimeric proteins consisting of the first two domains of the human CD4-polypeptide and various domains of the constant regions of the heavy or light chains of mammalian immunoglobulins. See EP 394,827; and Traunecker et al., Nature 331:84-86 (1988). The polypeptides of the present invention fused or conjugated to an antibody having disulfide-linked dimeric structures (due to the IgG) may also be more efficient in binding and neutralizing other molecules, than the monomeric secreted protein or protein fragment alone. See, for example, Fountoulakis et al., J. Biochem. 270:3958-3964 (1995). In many cases, the Fc part in a fusion protein is beneficial in therapy and diagnosis, and thus can result in, for example, improved

pharmacokinetic properties. See, for example, EP A 232,262. Alternatively, deleting the Fc part after the fusion protein has been expressed, detected, and purified, would be desired. For example, the Fc portion may hinder therapy and diagnosis if the fusion protein is used as an antigen for immunizations. In drug discovery, for example, human proteins, such as hIL-5, have been fused with Fc portions for the purpose of high-throughput screening assays to identify antagonists of hIL-5. (See, Bennett et al., *J. Molecular Recognition* 8:52-58 (1995); Johanson et al., *J. Biol. Chem.* 270:9459-9471 (1995)).

[253] Moreover, the antibodies or fragments thereof of the present invention can be fused to marker sequences, such as a peptide to facilitate purification. In preferred embodiments, the marker amino acid sequence is a hexa-histidine peptide, such as the tag provided in a pQE vector (QIAGEN, Inc., 9259 Eton Avenue, Chatsworth, CA, 91311), among others, many of which are commercially available. As described in Gentz et al., *Proc. Natl. Acad. Sci. USA* 86:821-824 (1989), for instance, hexa-histidine provides for convenient purification of the fusion protein. Other peptide tags useful for purification include, but are not limited to, the "HA" tag, which corresponds to an epitope derived from the influenza hemagglutinin protein (Wilson et al., *Cell* 37:767 (1984)) and the "flag" tag.

[254] The present invention further encompasses antibodies or fragments thereof conjugated to a diagnostic or therapeutic agent. The antibodies can be used diagnostically to, for example, monitor the development or progression of a tumor as part of a clinical testing procedure to, e.g., determine the efficacy of a given treatment regimen. Detection can be facilitated by coupling the antibody to a detectable substance. Examples of detectable substances include various enzymes, prosthetic groups, fluorescent materials, luminescent materials, bioluminescent materials, radioactive materials, positron emitting metals using various positron emission tomographies, and nonradioactive paramagnetic metal ions. The detectable substance may be coupled or conjugated either directly to the antibody (or fragment thereof) or indirectly, through an intermediate (such as, for example, a linker known in the art) using techniques known in the art. See, for example, U.S. Patent No. 4,741,900 for metal ions which can be conjugated to antibodies for use as diagnostics according to the present invention. Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, beta-galactosidase, or acetylcholinesterase; examples of suitable prosthetic group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine fluorescein, dansyl chloride or

phycoerythrin; an example of a luminescent material includes luminol; examples of bioluminescent materials include luciferase, luciferin, and aequorin; and examples of suitable radioactive material include ^{125}I , ^{131}I , ^{111}In or ^{99}Tc .

[255] Further, an antibody or fragment thereof may be conjugated to a therapeutic moiety such as a cytotoxin, e.g., a cytostatic or cytocidal agent, a therapeutic agent or a radioactive metal ion, e.g., alpha-emitters such as, for example, ^{213}Bi . A cytotoxin or cytotoxic agent includes any agent that is detrimental to cells. Examples include paclitaxol, cytochalasin B, gramicidin D, ethidium bromide, emetine, mitomycin, etoposide, tenoposide, vincristine, vinblastine, colchicin, doxorubicin, daunorubicin, dihydroxy anthracin dione, mitoxantrone, mithramycin, actinomycin D, 1-dehydrotestosterone, glucocorticoids, procaine, tetracaine, lidocaine, propranolol, and puromycin and analogs or homologs thereof. Therapeutic agents include, but are not limited to, antimetabolites (e.g., methotrexate, 6-mercaptopurine, 6-thioguanine, cytarabine, 5-fluorouracil decarbazine), alkylating agents (e.g., mechlorethamine, thioepa chlorambucil, melphalan, carmustine (BSNU) and lomustine (CCNU), cyclophosphamide, busulfan, dibromomannitol, streptozotocin, mitomycin C, and cis- dichlorodiamine platinum (II) (DDP) cisplatin), anthracyclines (e.g., daunorubicin (formerly daunomycin) and doxorubicin), antibiotics (e.g., dactinomycin (formerly actinomycin), bleomycin, mithramycin, and anthramycin (AMC)), and anti-mitotic agents (e.g., vincristine and vinblastine).

[256] The conjugates of the invention can be used for modifying a given biological response, the therapeutic agent or drug moiety is not to be construed as limited to classical chemical therapeutic agents. For example, the drug moiety may be a protein or polypeptide possessing a desired biological activity. Such proteins may include, for example, a toxin such as abrin, ricin A, pseudomonas exotoxin, or diphtheria toxin; a protein such as tumor necrosis factor, α -interferon, β -interferon, nerve growth factor, platelet derived growth factor, tissue plasminogen activator, an apoptotic agent, e.g., TNF- α , TNF- β , AIM I (See, International Publication No. WO 97/33899), AIM II (See, International Publication No. WO 97/34911), Fas Ligand (Takahashi *et al.*, *Int. Immunol.*, 6:1567-1574 (1994)), VEGI (See, International Publication No. WO 99/23105), a thrombotic agent or an anti-angiogenic agent, e.g., angiostatin or endostatin; or, biological response modifiers such as, for example, lymphokines, interleukin-1 ("IL-1"), interleukin-2 ("IL-2"), interleukin-6 ("IL-6"), granulocyte macrophage colony stimulating factor ("GM-CSF"), granulocyte colony stimulating factor ("G-CSF"), or other growth factors.

[257] Antibodies may also be attached to solid supports, which are particularly useful for immunoassays or purification of the target antigen. Such solid supports include, but are not limited to, glass, cellulose, polyacrylamide, nylon, polystyrene, polyvinyl chloride or polypropylene.

[258] Techniques for conjugating such therapeutic moiety to antibodies are well known. See, for example, Arnon et al., "Monoclonal Antibodies For Immunotargeting Of Drugs In Cancer Therapy", in *Monoclonal Antibodies And Cancer Therapy*, Reisfeld et al. (eds.), pp. 243-56 (Alan R. Liss, Inc. 1985); Hellstrom et al., "Antibodies For Drug Delivery", in *Controlled Drug Delivery* (2nd Ed.), Robinson et al. (eds.), pp. 623-53 (Marcel Dekker, Inc. 1987); Thorpe, "Antibody Carriers Of Cytotoxic Agents In Cancer Therapy: A Review", in *Monoclonal Antibodies '84: Biological And Clinical Applications*, Pinchera et al. (eds.), pp. 475-506 (1985); "Analysis, Results, And Future Prospective Of The Therapeutic Use Of Radiolabeled Antibody In Cancer Therapy", in *Monoclonal Antibodies For Cancer Detection And Therapy*, Baldwin et al. (eds.), pp. 303-16 (Academic Press 1985), and Thorpe et al., "The Preparation And Cytotoxic Properties Of Antibody-Toxin Conjugates", *Immunol. Rev.* 62:119-58 (1982).

[259] Alternatively, an antibody can be conjugated to a second antibody to form an antibody heteroconjugate as described by Segal in U.S. Patent No. 4,676,980, which is incorporated herein by reference in its entirety.

[260] An antibody, with or without a therapeutic moiety conjugated to it, administered alone or in combination with cytotoxic factor(s) and/or cytokine(s) can be used as a therapeutic.

Immunophenotyping

[261] The antibodies of the invention may be utilized for immunophenotyping of cell lines and biological samples. Translation products of the gene of the present invention may be useful as cell-specific markers, or more specifically as cellular markers that are differentially expressed at various stages of differentiation and/or maturation of particular cell types. Monoclonal antibodies directed against a specific epitope, or combination of epitopes, will allow for the screening of cellular populations expressing the marker. Various techniques can be utilized using monoclonal antibodies to screen for cellular populations expressing the marker(s), and include magnetic separation using antibody-coated magnetic

beads, "panning" with antibody attached to a solid matrix (i.e., plate), and flow cytometry (See, e.g., U.S. Patent 5,985,660; and Morrison *et al.*, *Cell*, 96:737-49 (1999)).

[262] These techniques allow for the screening of particular populations of cells, such as might be found with hematological malignancies (i.e. minimal residual disease (MRD) in acute leukemic patients) and "non-self" cells in transplantations to prevent Graft-versus-Host Disease (GVHD). Alternatively, these techniques allow for the screening of hematopoietic stem and progenitor cells capable of undergoing proliferation and/or differentiation, as might be found in human umbilical cord blood.

Assays For Antibody Binding

[263] The antibodies of the invention may be assayed for immunospecific binding by any method known in the art. The immunoassays which can be used include but are not limited to competitive and non-competitive assay systems using techniques such as western blots, radioimmunoassays, ELISA (enzyme linked immunosorbent assay), "sandwich" immunoassays, immunoprecipitation assays, precipitin reactions, gel diffusion precipitin reactions, immunodiffusion assays, agglutination assays, complement-fixation assays, immunoradiometric assays, fluorescent immunoassays, and protein A immunoassays, to name but a few. Such assays are routine and well known in the art (see, e.g., Ausubel et al, eds, 1994, Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, which is incorporated by reference herein in its entirety). Exemplary immunoassays are described briefly below (but are not intended by way of limitation).

[264] Immunoprecipitation protocols generally comprise lysing a population of cells in a lysis buffer such as RIPA buffer (1% NP-40 or Triton X- 100, 1% sodium deoxycholate, 0.1% SDS, 0.15 M NaCl, 0.01 M sodium phosphate at pH 7.2, 1% Trasylol) supplemented with protein phosphatase and/or protease inhibitors (e.g., EDTA, PMSF, aprotinin, sodium vanadate), adding the antibody of interest to the cell lysate, incubating for a period of time (e.g., 1-4 hours) at 4° C, adding protein A and/or protein G sepharose beads to the cell lysate, incubating for about an hour or more at 4° C, washing the beads in lysis buffer and resuspending the beads in SDS/sample buffer. The ability of the antibody of interest to immunoprecipitate a particular antigen can be assessed by, e.g., western blot analysis. One of skill in the art would be knowledgeable as to the parameters that can be modified to increase the binding of the antibody to an antigen and decrease the background (e.g., pre-clearing the cell lysate with sepharose beads). For further discussion regarding

immunoprecipitation protocols see, e.g., Ausubel et al., eds., (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, section 10.16.1.

[265] Western blot analysis generally comprises preparing protein samples, electrophoresis of the protein samples in a polyacrylamide gel (e.g., 8%- 20% SDS-PAGE depending on the molecular weight of the antigen), transferring the protein sample from the polyacrylamide gel to a membrane such as nitrocellulose, PVDF or nylon, blocking the membrane in blocking solution (e.g., PBS with 3% BSA or non-fat milk), washing the membrane in washing buffer (e.g., PBS-Tween 20), blocking the membrane with primary antibody (the antibody of interest) diluted in blocking buffer, washing the membrane in washing buffer, blocking the membrane with a secondary antibody (which recognizes the primary antibody, e.g., an anti-human antibody) conjugated to an enzymatic substrate (e.g., horseradish peroxidase or alkaline phosphatase) or radioactive molecule (e.g., ^{32}P or ^{125}I) diluted in blocking buffer, washing the membrane in wash buffer, and detecting the presence of the antigen. One of skill in the art would be knowledgeable as to the parameters that can be modified to increase the signal detected and to reduce the background noise. For further discussion regarding western blot protocols see, e.g., Ausubel et al, eds, (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, section 10.8.1.

[266] ELISAs comprise preparing antigen, coating the well of a 96 well microtiter plate with the antigen, adding the antibody of interest conjugated to a detectable compound such as an enzymatic substrate (e.g., horseradish peroxidase or alkaline phosphatase) to the well and incubating for a period of time, and detecting the presence of the antigen. In ELISAs the antibody of interest does not have to be conjugated to a detectable compound; instead, a second antibody (which recognizes the antibody of interest) conjugated to a detectable compound may be added to the well. Further, instead of coating the well with the antigen, the antibody may be coated to the well. In this case, a second antibody conjugated to a detectable compound may be added following the addition of the antigen of interest to the coated well. One of skill in the art would be knowledgeable as to the parameters that can be modified to increase the signal detected as well as other variations of ELISAs known in the art. For further discussion regarding ELISAs see, e.g., Ausubel et al, eds, (1994), Current Protocols in Molecular Biology, Vol. 1, John Wiley & Sons, Inc., New York, section 11.2.1.

[267] The binding affinity of an antibody to an antigen and the off-rate of an antibody-antigen interaction can be determined by competitive binding assays. One example of a competitive binding assay is a radioimmunoassay comprising the incubation of labeled antigen (e.g., ^3H or ^{125}I) with the antibody of interest in the presence of increasing amounts of unlabeled antigen, and the detection of the antibody bound to the labeled antigen. The affinity of the antibody of interest for a particular antigen and the binding off-rates can be determined from the data by scatchard plot analysis. Competition with a second antibody can also be determined using radioimmunoassays. In this case, the antigen is incubated with antibody of interest conjugated to a labeled compound (e.g., ^3H or ^{125}I) in the presence of increasing amounts of an unlabeled second antibody.

[268] Antibodies of the invention may be characterized using immunocytochemistry methods on cells (e.g., mammalian cells, such as CHO cells) transfected with a vector enabling the expression of an antigen or with vector alone using techniques commonly known in the art. Antibodies that bind antigen transfected cells, but not vector-only transfected cells, are antigen specific.

Therapeutic Uses

[269] The present invention is further directed to antibody-based therapies which involve administering antibodies of the invention to an animal, preferably a mammal, and most preferably a human, patient for treating one or more of the disclosed diseases, disorders, or conditions. Therapeutic compounds of the invention include, but are not limited to, antibodies of the invention (including fragments, analogs and derivatives thereof as described herein) and nucleic acids encoding antibodies of the invention (including fragments, analogs and derivatives thereof and anti-idiotypic antibodies as described herein). The antibodies of the invention can be used to treat, inhibit or prevent diseases, disorders or conditions associated with aberrant expression and/or activity of a polypeptide of the invention, including, but not limited to, any one or more of the diseases, disorders, or conditions described herein. The treatment and/or prevention of diseases, disorders, or conditions associated with aberrant expression and/or activity of a polypeptide of the invention includes, but is not limited to, alleviating symptoms associated with those diseases, disorders or conditions. Antibodies of the invention may be provided in pharmaceutically acceptable compositions as known in the art or as described herein.

[270] In a specific and preferred embodiment, the present invention is directed to antibody-based therapies which involve administering antibodies of the invention to an animal, preferably a mammal, and most preferably a human, patient for treating one or more diseases, disorders, or conditions, including but not limited to: neural disorders, immune system disorders, muscular disorders, reproductive disorders, gastrointestinal disorders, pulmonary disorders, cardiovascular disorders, renal disorders, proliferative disorders, and/or cancerous diseases and conditions., and/or as described elsewhere herein. Therapeutic compounds of the invention include, but are not limited to, antibodies of the invention (e.g., antibodies directed to the full length protein expressed on the cell surface of a mammalian cell; antibodies directed to an epitope of a polypeptide of the invention (such as, for example, a predicted linear epitope shown in column 7 of Table 1A; or a conformational epitope, including fragments, analogs and derivatives thereof as described herein) and nucleic acids encoding antibodies of the invention (including fragments, analogs and derivatives thereof and anti-idiotypic antibodies as described herein). The antibodies of the invention can be used to treat, inhibit or prevent diseases, disorders or conditions associated with aberrant expression and/or activity of a polypeptide of the invention, including, but not limited to, any one or more of the diseases, disorders, or conditions described herein. The treatment and/or prevention of diseases, disorders, or conditions associated with aberrant expression and/or activity of a polypeptide of the invention includes, but is not limited to, alleviating symptoms associated with those diseases, disorders or conditions. Antibodies of the invention may be provided in pharmaceutically acceptable compositions as known in the art or as described herein.

[271] A summary of the ways in which the antibodies of the present invention may be used therapeutically includes binding polynucleotides or polypeptides of the present invention locally or systemically in the body or by direct cytotoxicity of the antibody, e.g. as mediated by complement (CDC) or by effector cells (ADCC). Some of these approaches are described in more detail below. Armed with the teachings provided herein, one of ordinary skill in the art will know how to use the antibodies of the present invention for diagnostic, monitoring or therapeutic purposes without undue experimentation.

[272] The antibodies of this invention may be advantageously utilized in combination with other monoclonal or chimeric antibodies, or with lymphokines or hematopoietic growth factors (such as, e.g., IL-2, IL-3 and IL-7), for example, which serve to increase the number or activity of effector cells which interact with the antibodies.

[273] The antibodies of the invention may be administered alone or in combination with other types of treatments (e.g., radiation therapy, chemotherapy, hormonal therapy, immunotherapy and anti-tumor agents). Generally, administration of products of a species origin or species reactivity (in the case of antibodies) that is the same species as that of the patient is preferred. Thus, in a preferred embodiment, human antibodies, fragments derivatives, analogs, or nucleic acids, are administered to a human patient for therapy or prophylaxis.

[274] It is preferred to use high affinity and/or potent *in vivo* inhibiting and/or neutralizing antibodies against polypeptides or polynucleotides of the present invention, fragments or regions thereof, for both immunoassays directed to and therapy of disorders related to polynucleotides or polypeptides, including fragments thereof, of the present invention. Such antibodies, fragments, or regions, will preferably have an affinity for polynucleotides or polypeptides of the invention, including fragments thereof. Preferred binding affinities include those with a dissociation constant or K_d less than 5×10^{-2} M, 10^{-2} M, 5×10^{-3} M, 10^{-3} M, 5×10^{-4} M, 10^{-4} M, 5×10^{-5} M, 10^{-5} M, 5×10^{-6} M, 10^{-6} M, 5×10^{-7} M, 10^{-7} M, 5×10^{-8} M, 10^{-8} M, 5×10^{-9} M, 10^{-9} M, 5×10^{-10} M, 10^{-10} M, 5×10^{-11} M, 10^{-11} M, 5×10^{-12} M, 10^{-12} M, 5×10^{-13} M, 10^{-13} M, 5×10^{-14} M, 10^{-14} M, 5×10^{-15} M, and 10^{-15} M.

Gene Therapy

[275] In a specific embodiment, nucleic acids comprising sequences encoding antibodies or functional derivatives thereof, are administered to treat, inhibit or prevent a disease or disorder associated with aberrant expression and/or activity of a polypeptide of the invention, by way of gene therapy. Gene therapy refers to therapy performed by the administration to a subject of an expressed or expressible nucleic acid. In this embodiment of the invention, the nucleic acids produce their encoded protein that mediates a therapeutic effect.

[276] Any of the methods for gene therapy available in the art can be used according to the present invention. Exemplary methods are described below.

[277] For general reviews of the methods of gene therapy, see Goldspiel et al., *Clinical Pharmacy* 12:488-505 (1993); Wu and Wu, *Biotherapy* 3:87-95 (1991); Tolstoshev, *Ann. Rev. Pharmacol. Toxicol.* 32:573-596 (1993); Mulligan, *Science* 260:926-932 (1993); and Morgan and Anderson, *Ann. Rev. Biochem.* 62:191-217 (1993); May, TIBTECH

11(5):155-215 (1993). Methods commonly known in the art of recombinant DNA technology which can be used are described in Ausubel et al. (eds.), Current Protocols in Molecular Biology, John Wiley & Sons, NY (1993); and Kriegler, Gene Transfer and Expression, A Laboratory Manual, Stockton Press, NY (1990).

[278] In a preferred embodiment, the compound comprises nucleic acid sequences encoding an antibody, said nucleic acid sequences being part of expression vectors that express the antibody or fragments or chimeric proteins or heavy or light chains thereof in a suitable host. In particular, such nucleic acid sequences have promoters operably linked to the antibody coding region, said promoter being inducible or constitutive, and, optionally, tissue-specific. In another particular embodiment, nucleic acid molecules are used in which the antibody coding sequences and any other desired sequences are flanked by regions that promote homologous recombination at a desired site in the genome, thus providing for intrachromosomal expression of the antibody encoding nucleic acids (Koller and Smithies, Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989); Zijlstra et al., Nature 342:435-438 (1989). In specific embodiments, the expressed antibody molecule is a single chain antibody; alternatively, the nucleic acid sequences include sequences encoding both the heavy and light chains, or fragments thereof, of the antibody.

[279] Delivery of the nucleic acids into a patient may be either direct, in which case the patient is directly exposed to the nucleic acid or nucleic acid- carrying vectors, or indirect, in which case, cells are first transformed with the nucleic acids *in vitro*, then transplanted into the patient. These two approaches are known, respectively, as *in vivo* or *ex vivo* gene therapy.

[280] In a specific embodiment, the nucleic acid sequences are directly administered *in vivo*, where it is expressed to produce the encoded product. This can be accomplished by any of numerous methods known in the art, e.g., by constructing them as part of an appropriate nucleic acid expression vector and administering it so that they become intracellular, e.g., by infection using defective or attenuated retrovirals or other viral vectors (see U.S. Patent No. 4,980,286), or by direct injection of naked DNA, or by use of microparticle bombardment (e.g., a gene gun; Biolistic, Dupont), or coating with lipids or cell-surface receptors or transfecting agents, encapsulation in liposomes, microparticles, or microcapsules, or by administering them in linkage to a peptide which is known to enter the nucleus, by administering it in linkage to a ligand subject to receptor-mediated endocytosis (see, e.g., Wu and Wu, J. Biol. Chem. 262:4429-4432 (1987)) (which can be

used to target cell types specifically expressing the receptors), etc. In another embodiment, nucleic acid-ligand complexes can be formed in which the ligand comprises a fusogenic viral peptide to disrupt endosomes, allowing the nucleic acid to avoid lysosomal degradation. In yet another embodiment, the nucleic acid can be targeted *in vivo* for cell specific uptake and expression, by targeting a specific receptor (see, e.g., PCT Publications WO 92/06180; WO 92/22635; WO92/20316; WO93/14188, WO 93/20221). Alternatively, the nucleic acid can be introduced intracellularly and incorporated within host cell DNA for expression, by homologous recombination (Koller and Smithies, Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989); Zijlstra et al., Nature 342:435-438 (1989)).

[281] In a specific embodiment, viral vectors that contains nucleic acid sequences encoding an antibody of the invention are used. For example, a retroviral vector can be used (see Miller et al., Meth. Enzymol. 217:581-599 (1993)). These retroviral vectors contain the components necessary for the correct packaging of the viral genome and integration into the host cell DNA. The nucleic acid sequences encoding the antibody to be used in gene therapy are cloned into one or more vectors, which facilitates delivery of the gene into a patient. More detail about retroviral vectors can be found in Boesen et al., Biotherapy 6:291-302 (1994), which describes the use of a retroviral vector to deliver the *mdr1* gene to hematopoietic stem cells in order to make the stem cells more resistant to chemotherapy. Other references illustrating the use of retroviral vectors in gene therapy are: Clowes et al., J. Clin. Invest. 93:644-651 (1994); Kiem et al., Blood 83:1467-1473 (1994); Salmons and Gunzberg, Human Gene Therapy 4:129-141 (1993); and Grossman and Wilson, Curr. Opin. in Genetics and Devel. 3:110-114 (1993).

[282] Adenoviruses are other viral vectors that can be used in gene therapy. Adenoviruses are especially attractive vehicles for delivering genes to respiratory epithelia. Adenoviruses naturally infect respiratory epithelia where they cause a mild disease. Other targets for adenovirus-based delivery systems are liver, the central nervous system, endothelial cells, and muscle. Adenoviruses have the advantage of being capable of infecting non-dividing cells. Kozarsky and Wilson, Current Opinion in Genetics and Development 3:499-503 (1993) present a review of adenovirus-based gene therapy. Bout et al., Human Gene Therapy 5:3-10 (1994) demonstrated the use of adenovirus vectors to transfer genes to the respiratory epithelia of rhesus monkeys. Other instances of the use of adenoviruses in gene therapy can be found in Rosenfeld et al., Science 252:431-434 (1991); Rosenfeld et al., Cell 68:143-155 (1992); Mastrangeli et al., J. Clin. Invest. 91:225-234

(1993); PCT Publication WO94/12649; and Wang, et al., Gene Therapy 2:775-783 (1995). In a preferred embodiment, adenovirus vectors are used.

[283] Adeno-associated virus (AAV) has also been proposed for use in gene therapy (Walsh et al., Proc. Soc. Exp. Biol. Med. 204:289-300 (1993); U.S. Patent No. 5,436,146).

[284] Another approach to gene therapy involves transferring a gene to cells in tissue culture by such methods as electroporation, lipofection, calcium phosphate mediated transfection, or viral infection. Usually, the method of transfer includes the transfer of a selectable marker to the cells. The cells are then placed under selection to isolate those cells that have taken up and are expressing the transferred gene. Those cells are then delivered to a patient.

[285] In this embodiment, the nucleic acid is introduced into a cell prior to administration *in vivo* of the resulting recombinant cell. Such introduction can be carried out by any method known in the art, including but not limited to transfection, electroporation, microinjection, infection with a viral or bacteriophage vector containing the nucleic acid sequences, cell fusion, chromosome-mediated gene transfer, microcell-mediated gene transfer, spheroplast fusion, etc. Numerous techniques are known in the art for the introduction of foreign genes into cells (see, e.g., Loeffler and Behr, Meth. Enzymol. 217:599-618 (1993); Cohen et al., Meth. Enzymol. 217:618-644 (1993); Cline, Pharmac. Ther. 29:69-92m (1985) and may be used in accordance with the present invention, provided that the necessary developmental and physiological functions of the recipient cells are not disrupted. The technique should provide for the stable transfer of the nucleic acid to the cell, so that the nucleic acid is expressible by the cell and preferably heritable and expressible by its cell progeny.

[286] The resulting recombinant cells can be delivered to a patient by various methods known in the art. Recombinant blood cells (e.g., hematopoietic stem or progenitor cells) are preferably administered intravenously. The amount of cells envisioned for use depends on the desired effect, patient state, etc., and can be determined by one skilled in the art.

[287] Cells into which a nucleic acid can be introduced for purposes of gene therapy encompass any desired, available cell type, and include but are not limited to epithelial cells, endothelial cells, keratinocytes, fibroblasts, muscle cells, hepatocytes; blood cells such as T lymphocytes, B lymphocytes, monocytes, macrophages, neutrophils, eosinophils, megakaryocytes, granulocytes; various stem or progenitor cells, in particular hematopoietic

stem or progenitor cells, e.g., as obtained from bone marrow, umbilical cord blood, peripheral blood, fetal liver, etc.

[288] In a preferred embodiment, the cell used for gene therapy is autologous to the patient.

[289] In an embodiment in which recombinant cells are used in gene therapy, nucleic acid sequences encoding an antibody are introduced into the cells such that they are expressible by the cells or their progeny, and the recombinant cells are then administered *in vivo* for therapeutic effect. In a specific embodiment, stem or progenitor cells are used. Any stem and/or progenitor cells which can be isolated and maintained *in vitro* can potentially be used in accordance with this embodiment of the present invention (see e.g. PCT Publication WO 94/08598; Stemple and Anderson, Cell 71:973-985 (1992); Rheinwald, Meth. Cell Bio. 21A:229 (1980); and Pittelkow and Scott, Mayo Clinic Proc. 61:771 (1986)).

[290] In a specific embodiment, the nucleic acid to be introduced for purposes of gene therapy comprises an inducible promoter operably linked to the coding region, such that expression of the nucleic acid is controllable by the presence or absence of an appropriate inducer of transcription.

Demonstration of Therapeutic or Prophylactic Activity

[291] The compounds or pharmaceutical compositions of the invention are preferably tested *in vitro*, and then *in vivo* for the desired therapeutic or prophylactic activity, prior to use in humans. For example, *in vitro* assays to demonstrate the therapeutic or prophylactic utility of a compound or pharmaceutical composition include, the effect of a compound on a cell line or a patient tissue sample. The effect of the compound or composition on the cell line and/or tissue sample can be determined utilizing techniques known to those of skill in the art including, but not limited to, rosette formation assays and cell lysis assays. In accordance with the invention, *in vitro* assays which can be used to determine whether administration of a specific compound is indicated, include *in vitro* cell culture assays in which a patient tissue sample is grown in culture, and exposed to or otherwise administered a compound, and the effect of such compound upon the tissue sample is observed.

Therapeutic/Prophylactic Administration and Composition

[292] The invention provides methods of treatment, inhibition and prophylaxis by administration to a subject of an effective amount of a compound or pharmaceutical composition of the invention, preferably a polypeptide or antibody of the invention. In a preferred embodiment, the compound is substantially purified (e.g., substantially free from substances that limit its effect or produce undesired side-effects). The subject is preferably an animal, including but not limited to animals such as cows, pigs, horses, chickens, cats, dogs, etc., and is preferably a mammal, and most preferably human.

[293] Formulations and methods of administration that can be employed when the compound comprises a nucleic acid or an immunoglobulin are described above; additional appropriate formulations and routes of administration can be selected from among those described herein below.

[294] Various delivery systems are known and can be used to administer a compound of the invention, e.g., encapsulation in liposomes, microparticles, microcapsules, recombinant cells capable of expressing the compound, receptor-mediated endocytosis (see, e.g., Wu and Wu, J. Biol. Chem. 262:4429-4432 (1987)), construction of a nucleic acid as part of a retroviral or other vector, etc. Methods of introduction include but are not limited to intradermal, intramuscular, intraperitoneal, intravenous, subcutaneous, intranasal, epidural, and oral routes. The compounds or compositions may be administered by any convenient route, for example by infusion or bolus injection, by absorption through epithelial or mucocutaneous linings (e.g., oral mucosa, rectal and intestinal mucosa, etc.) and may be administered together with other biologically active agents. Administration can be systemic or local. In addition, it may be desirable to introduce the pharmaceutical compounds or compositions of the invention into the central nervous system by any suitable route, including intraventricular and intrathecal injection; intraventricular injection may be facilitated by an intraventricular catheter, for example, attached to a reservoir, such as an Ommaya reservoir. Pulmonary administration can also be employed, e.g., by use of an inhaler or nebulizer, and formulation with an aerosolizing agent.

[295] In a specific embodiment, it may be desirable to administer the pharmaceutical compounds or compositions of the invention locally to the area in need of treatment; this may be achieved by, for example, and not by way of limitation, local infusion during surgery, topical application, e.g., in conjunction with a wound dressing after surgery, by injection, by means of a catheter, by means of a suppository, or by means of an implant, said implant being of a porous, non-porous, or gelatinous material, including membranes,

such as sialastic membranes, or fibers. Preferably, when administering a protein, including an antibody, of the invention, care must be taken to use materials to which the protein does not absorb.

[296] In another embodiment, the compound or composition can be delivered in a vesicle, in particular a liposome (see Langer, *Science* 249:1527-1533 (1990); Treat et al., in *Liposomes in the Therapy of Infectious Disease and Cancer*, Lopez-Berestein and Fidler (eds.), Liss, New York, pp. 353- 365 (1989); Lopez-Berestein, *ibid.*, pp. 317-327; see generally *ibid.*)

[297] In yet another embodiment, the compound or composition can be delivered in a controlled release system. In one embodiment, a pump may be used (see Langer, *supra*; Sefton, *CRC Crit. Ref. Biomed. Eng.* 14:201 (1987); Buchwald et al., *Surgery* 88:507 (1980); Saudek et al., *N. Engl. J. Med.* 321:574 (1989)). In another embodiment, polymeric materials can be used (see *Medical Applications of Controlled Release*, Langer and Wise (eds.), CRC Pres., Boca Raton, Florida (1974); *Controlled Drug Bioavailability, Drug Product Design and Performance*, Smolen and Ball (eds.), Wiley, New York (1984); Ranger and Peppas, J., *Macromol. Sci. Rev. Macromol. Chem.* 23:61 (1983); see also Levy et al., *Science* 228:190 (1985); During et al., *Ann. Neurol.* 25:351 (1989); Howard et al., *J.Neurosurg.* 71:105 (1989)). In yet another embodiment, a controlled release system can be placed in proximity of the therapeutic target, e.g., the brain, thus requiring only a fraction of the systemic dose (see, e.g., Goodson, in *Medical Applications of Controlled Release*, *supra*, vol. 2, pp. 115-138 (1984)).

[298] Other controlled release systems are discussed in the review by Langer (*Science* 249:1527-1533 (1990)).

[299] In a specific embodiment where the compound of the invention is a nucleic acid encoding a protein, the nucleic acid can be administered *in vivo* to promote expression of its encoded protein, by constructing it as part of an appropriate nucleic acid expression vector and administering it so that it becomes intracellular, e.g., by use of a retroviral vector (see U.S. Patent No. 4,980,286), or by direct injection, or by use of microparticle bombardment (e.g., a gene gun; Biolistic, Dupont), or coating with lipids or cell-surface receptors or transfecting agents, or by administering it in linkage to a homeobox- like peptide which is known to enter the nucleus (see e.g., Joliot et al., *Proc. Natl. Acad. Sci. USA* 88:1864-1868 (1991)), etc. Alternatively, a nucleic acid can be introduced intracellularly and incorporated within host cell DNA for expression, by homologous recombination.

[300] The present invention also provides pharmaceutical compositions. Such compositions comprise a therapeutically effective amount of a compound, and a pharmaceutically acceptable carrier. In a specific embodiment, the term "pharmaceutically acceptable" means approved by a regulatory agency of the Federal or a state government or listed in the U.S. Pharmacopeia or other generally recognized pharmacopeia for use in animals, and more particularly in humans. The term "carrier" refers to a diluent, adjuvant, excipient, or vehicle with which the therapeutic is administered. Such pharmaceutical carriers can be sterile liquids, such as water and oils, including those of petroleum, animal, vegetable or synthetic origin, such as peanut oil, soybean oil, mineral oil, sesame oil and the like. Water is a preferred carrier when the pharmaceutical composition is administered intravenously. Saline solutions and aqueous dextrose and glycerol solutions can also be employed as liquid carriers, particularly for injectable solutions. Suitable pharmaceutical excipients include starch, glucose, lactose, sucrose, gelatin, malt, rice, flour, chalk, silica gel, sodium stearate, glycerol monostearate, talc, sodium chloride, dried skim milk, glycerol, propylene, glycol, water, ethanol and the like. The composition, if desired, can also contain minor amounts of wetting or emulsifying agents, or pH buffering agents. These compositions can take the form of solutions, suspensions, emulsion, tablets, pills, capsules, powders, sustained-release formulations and the like. The composition can be formulated as a suppository, with traditional binders and carriers such as triglycerides. Oral formulation can include standard carriers such as pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharine, cellulose, magnesium carbonate, etc. Examples of suitable pharmaceutical carriers are described in "Remington's Pharmaceutical Sciences" by E.W. Martin. Such compositions will contain a therapeutically effective amount of the compound, preferably in purified form, together with a suitable amount of carrier so as to provide the form for proper administration to the patient. The formulation should suit the mode of administration.

[301] In a preferred embodiment, the composition is formulated in accordance with routine procedures as a pharmaceutical composition adapted for intravenous administration to human beings. Typically, compositions for intravenous administration are solutions in sterile isotonic aqueous buffer. Where necessary, the composition may also include a solubilizing agent and a local anesthetic such as lignocaine to ease pain at the site of the injection. Generally, the ingredients are supplied either separately or mixed together in unit dosage form, for example, as a dry lyophilized powder or water free concentrate in a

hermetically sealed container such as an ampoule or sachette indicating the quantity of active agent. Where the composition is to be administered by infusion, it can be dispensed with an infusion bottle containing sterile pharmaceutical grade water or saline. Where the composition is administered by injection, an ampoule of sterile water for injection or saline can be provided so that the ingredients may be mixed prior to administration.

[302] The compounds of the invention can be formulated as neutral or salt forms. Pharmaceutically acceptable salts include those formed with anions such as those derived from hydrochloric, phosphoric, acetic, oxalic, tartaric acids, etc., and those formed with cations such as those derived from sodium, potassium, ammonium, calcium, ferric hydroxides, isopropylamine, triethylamine, 2-ethylamino ethanol, histidine, procaine, etc.

[303] The amount of the compound of the invention which will be effective in the treatment, inhibition and prevention of a disease or disorder associated with aberrant expression and/or activity of a polypeptide of the invention can be determined by standard clinical techniques. In addition, in vitro assays may optionally be employed to help identify optimal dosage ranges. The precise dose to be employed in the formulation will also depend on the route of administration, and the seriousness of the disease or disorder, and should be decided according to the judgment of the practitioner and each patient's circumstances. Effective doses may be extrapolated from dose-response curves derived from in vitro or animal model test systems.

[304] For antibodies, the dosage administered to a patient is typically 0.1 mg/kg to 100 mg/kg of the patient's body weight. Preferably, the dosage administered to a patient is between 0.1 mg/kg and 20 mg/kg of the patient's body weight, more preferably 1 mg/kg to 10 mg/kg of the patient's body weight. Generally, human antibodies have a longer half-life within the human body than antibodies from other species due to the immune response to the foreign polypeptides. Thus, lower dosages of human antibodies and less frequent administration is often possible. Further, the dosage and frequency of administration of antibodies of the invention may be reduced by enhancing uptake and tissue penetration (e.g., into the brain) of the antibodies by modifications such as, for example, lipidation.

[305] The invention also provides a pharmaceutical pack or kit comprising one or more containers filled with one or more of the ingredients of the pharmaceutical compositions of the invention. Optionally associated with such container(s) can be a notice in the form prescribed by a governmental agency regulating the manufacture, use or sale of

pharmaceuticals or biological products, which notice reflects approval by the agency of manufacture, use or sale for human administration.

Diagnosis and Imaging

[306] Labeled antibodies, and derivatives and analogs thereof, which specifically bind to a polypeptide of interest can be used for diagnostic purposes to detect, diagnose, or monitor diseases, disorders, and/or conditions associated with the aberrant expression and/or activity of a polypeptide of the invention. The invention provides for the detection of aberrant expression of a polypeptide of interest, comprising (a) assaying the expression of the polypeptide of interest in cells or body fluid of an individual using one or more antibodies specific to the polypeptide interest and (b) comparing the level of gene expression with a standard gene expression level, whereby an increase or decrease in the assayed polypeptide gene expression level compared to the standard expression level is indicative of aberrant expression.

[307] The invention provides a diagnostic assay for diagnosing a disorder, comprising (a) assaying the expression of the polypeptide of interest in cells or body fluid of an individual using one or more antibodies specific to the polypeptide interest and (b) comparing the level of gene expression with a standard gene expression level, whereby an increase or decrease in the assayed polypeptide gene expression level compared to the standard expression level is indicative of a particular disorder. With respect to cancer, the presence of a relatively high amount of transcript in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the cancer.

[308] Antibodies of the invention can be used to assay protein levels in a biological sample using classical immunohistological methods known to those of skill in the art (e.g., see Jalkanen et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen et al., J. Cell . Biol. 105:3087-3096 (1987)). Other antibody-based methods useful for detecting protein gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase; radioisotopes, such as iodine

(125I, 121I), carbon (14C), sulfur (35S), tritium (3H), indium (112In), and technetium (99Tc); luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin.

[309] One facet of the invention is the detection and diagnosis of a disease or disorder associated with aberrant expression of a polypeptide of interest in an animal, preferably a mammal and most preferably a human. In one embodiment, diagnosis comprises: a) administering (for example, parenterally, subcutaneously, or intraperitoneally) to a subject an effective amount of a labeled molecule which specifically binds to the polypeptide of interest; b) waiting for a time interval following the administering for permitting the labeled molecule to preferentially concentrate at sites in the subject where the polypeptide is expressed (and for unbound labeled molecule to be cleared to background level); c) determining background level; and d) detecting the labeled molecule in the subject, such that detection of labeled molecule above the background level indicates that the subject has a particular disease or disorder associated with aberrant expression of the polypeptide of interest. Background level can be determined by various methods including, comparing the amount of labeled molecule detected to a standard value previously determined for a particular system.

[310] It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of 99mTc. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which contain the specific protein. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments." (Chapter 13 in *Tumor Imaging: The Radiochemical Detection of Cancer*, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

[311] Depending on several variables, including the type of label used and the mode of administration, the time interval following the administration for permitting the labeled molecule to preferentially concentrate at sites in the subject and for unbound labeled molecule to be cleared to background level is 6 to 48 hours or 6 to 24 hours or 6 to 12 hours. In another embodiment the time interval following administration is 5 to 20 days or 5 to 10 days.

[312] In an embodiment, monitoring of the disease or disorder is carried out by repeating the method for diagnosing the disease or disease, for example, one month after initial diagnosis, six months after initial diagnosis, one year after initial diagnosis, etc.

[313] Presence of the labeled molecule can be detected in the patient using methods known in the art for *in vivo* scanning. These methods depend upon the type of label used. Skilled artisans will be able to determine the appropriate method for detecting a particular label. Methods and devices that may be used in the diagnostic methods of the invention include, but are not limited to, computed tomography (CT), whole body scan such as position emission tomography (PET), magnetic resonance imaging (MRI), and sonography.

[314] In a specific embodiment, the molecule is labeled with a radioisotope and is detected in the patient using a radiation responsive surgical instrument (Thurston et al., U.S. Patent No. 5,441,050). In another embodiment, the molecule is labeled with a fluorescent compound and is detected in the patient using a fluorescence responsive scanning instrument. In another embodiment, the molecule is labeled with a positron emitting metal and is detected in the patient using positron emission-tomography. In yet another embodiment, the molecule is labeled with a paramagnetic label and is detected in a patient using magnetic resonance imaging (MRI).

Kits

[315] The present invention provides kits that can be used in the above methods. In one embodiment, a kit comprises an antibody of the invention, preferably a purified antibody, in one or more containers. In a specific embodiment, the kits of the present invention contain a substantially isolated polypeptide comprising an epitope which is specifically immunoreactive with an antibody included in the kit. Preferably, the kits of the present invention further comprise a control antibody which does not react with the polypeptide of interest. In another specific embodiment, the kits of the present invention contain a means for detecting the binding of an antibody to a polypeptide of interest (e.g., the antibody may be conjugated to a detectable substrate such as a fluorescent compound, an enzymatic substrate, a radioactive compound or a luminescent compound, or a second antibody which recognizes the first antibody may be conjugated to a detectable substrate).

[316] In another specific embodiment of the present invention, the kit is a diagnostic kit for use in screening serum containing antibodies specific against proliferative and/or cancerous polynucleotides and polypeptides. Such a kit may include a control antibody that

does not react with the polypeptide of interest. Such a kit may include a substantially isolated polypeptide antigen comprising an epitope which is specifically immunoreactive with at least one anti-polypeptide antigen antibody. Further, such a kit includes means for detecting the binding of said antibody to the antigen (e.g., the antibody may be conjugated to a fluorescent compound such as fluorescein or rhodamine which can be detected by flow cytometry). In specific embodiments, the kit may include a recombinantly produced or chemically synthesized polypeptide antigen. The polypeptide antigen of the kit may also be attached to a solid support.

[317] In a more specific embodiment the detecting means of the above-described kit includes a solid support to which said polypeptide antigen is attached. Such a kit may also include a non-attached reporter-labeled anti-human antibody. In this embodiment, binding of the antibody to the polypeptide antigen can be detected by binding of the said reporter-labeled antibody.

[318] In an additional embodiment, the invention includes a diagnostic kit for use in screening serum containing antigens of the polypeptide of the invention. The diagnostic kit includes a substantially isolated antibody specifically immunoreactive with polypeptide or polynucleotide antigens, and means for detecting the binding of the polynucleotide or polypeptide antigen to the antibody. In one embodiment, the antibody is attached to a solid support. In a specific embodiment, the antibody may be a monoclonal antibody. The detecting means of the kit may include a second, labeled monoclonal antibody. Alternatively, or in addition, the detecting means may include a labeled, competing antigen.

[319] In one diagnostic configuration, test serum is reacted with a solid phase reagent having a surface-bound antigen obtained by the methods of the present invention. After binding with specific antigen antibody to the reagent and removing unbound serum components by washing, the reagent is reacted with reporter-labeled anti-human antibody to bind reporter to the reagent in proportion to the amount of bound anti-antigen antibody on the solid support. The reagent is again washed to remove unbound labeled antibody, and the amount of reporter associated with the reagent is determined. Typically, the reporter is an enzyme which is detected by incubating the solid phase in the presence of a suitable fluorometric, luminescent or colorimetric substrate (Sigma, St. Louis, MO).

[320] The solid surface reagent in the above assay is prepared by known techniques for attaching protein material to solid support material, such as polymeric beads, dip sticks, 96-well plate or filter material. These attachment methods generally include non-specific

adsorption of the protein to the support or covalent attachment of the protein, typically through a free amine group, to a chemically reactive group on the solid support, such as an activated carboxyl, hydroxyl, or aldehyde group. Alternatively, streptavidin coated plates can be used in conjunction with biotinylated antigen(s).

[321] Thus, the invention provides an assay system or kit for carrying out this diagnostic method. The kit generally includes a support with surface-bound recombinant antigens, and a reporter-labeled anti-human antibody for detecting surface-bound anti-antigen antibody.

Uses of the Polynucleotides

[322] Each of the polynucleotides identified herein can be used in numerous ways as reagents. The following description should be considered exemplary and utilizes known techniques.

[323] The polynucleotides of the present invention are useful for chromosome identification. There exists an ongoing need to identify new chromosome markers, since few chromosome marking reagents, based on actual sequence data (repeat polymorphisms), are presently available. Each sequence is specifically targeted to and can hybridize with a particular location on an individual human chromosome, thus each polynucleotide of the present invention can routinely be used as a chromosome marker using techniques known in the art. Table 1A, column 9 provides the chromosome location of some of the polynucleotides of the invention.

[324] Briefly, sequences can be mapped to chromosomes by preparing PCR primers (preferably at least 15 bp (e.g., 15-25 bp) from the sequences shown in SEQ ID NO:X. Primers can optionally be selected using computer analysis so that primers do not span more than one predicted exon in the genomic DNA. These primers are then used for PCR screening of somatic cell hybrids containing individual human chromosomes. Only those hybrids containing the human gene corresponding to SEQ ID NO:X will yield an amplified fragment.

[325] Similarly, somatic hybrids provide a rapid method of PCR mapping the polynucleotides to particular chromosomes. Three or more clones can be assigned per day using a single thermal cycler. Moreover, sublocalization of the polynucleotides can be achieved with panels of specific chromosome fragments. Other gene mapping strategies

that can be used include in situ hybridization, prescreening with labeled flow-sorted chromosomes, preselection by hybridization to construct chromosome specific-cDNA libraries, and computer mapping techniques (See, e.g., Shuler, Trends Biotechnol 16:456-459 (1998) which is hereby incorporated by reference in its entirety).

[326] Precise chromosomal location of the polynucleotides can also be achieved using fluorescence in situ hybridization (FISH) of a metaphase chromosomal spread. This technique uses polynucleotides as short as 500 or 600 bases; however, polynucleotides 2,000-4,000 bp are preferred. For a review of this technique, see Verma et al., "Human Chromosomes: a Manual of Basic Techniques," Pergamon Press, New York (1988).

[327] For chromosome mapping, the polynucleotides can be used individually (to mark a single chromosome or a single site on that chromosome) or in panels (for marking multiple sites and/or multiple chromosomes).

[328] Thus, the present invention also provides a method for chromosomal localization which involves (a) preparing PCR primers from the polynucleotide sequences in Table 1A and/or Table 2 and SEQ ID NO:X and (b) screening somatic cell hybrids containing individual chromosomes.

[329] The polynucleotides of the present invention would likewise be useful for radiation hybrid mapping, HAPPY mapping, and long range restriction mapping. For a review of these techniques and others known in the art, see, e.g. Dear, "Genome Mapping: A Practical Approach," IRL Press at Oxford University Press, London (1997); Aydin, J. Mol. Med. 77:691-694 (1999); Hacia et al., Mol. Psychiatry 3:483-492 (1998); Herrick et al., Chromosome Res. 7:409-423 (1999); Hamilton et al., Methods Cell Biol. 62:265-280 (2000); and/or Ott, J. Hered. 90:68-70 (1999) each of which is hereby incorporated by reference in its entirety.

[330] Once a polynucleotide has been mapped to a precise chromosomal location, the physical position of the polynucleotide can be used in linkage analysis. Linkage analysis establishes coinheritance between a chromosomal location and presentation of a particular disease. (Disease mapping data are found, for example, in V. McKusick, Mendelian Inheritance in Man (available on line through Johns Hopkins University Welch Medical Library)). Column 10 of Table 1A provides an OMIM reference identification number of diseases associated with the cytologic band disclosed in column 9 of Table 1A, as determined using techniques described herein and by reference to Table 5. Assuming 1 megabase mapping resolution and one gene per 20 kb, a cDNA precisely localized to a

chromosomal region associated with the disease could be one of 50-500 potential causative genes.

[331] Thus, once coinheritance is established, differences in a polynucleotide of the invention and the corresponding gene between affected and unaffected individuals can be examined. First, visible structural alterations in the chromosomes, such as deletions or translocations, are examined in chromosome spreads or by PCR. If no structural alterations exist, the presence of point mutations are ascertained. Mutations observed in some or all affected individuals, but not in normal individuals, indicates that the mutation may cause the disease. However, complete sequencing of the polypeptide and the corresponding gene from several normal individuals is required to distinguish the mutation from a polymorphism. If a new polymorphism is identified, this polymorphic polypeptide can be used for further linkage analysis.

[332] Furthermore, increased or decreased expression of the gene in affected individuals as compared to unaffected individuals can be assessed using the polynucleotides of the invention. Any of these alterations (altered expression, chromosomal rearrangement, or mutation) can be used as a diagnostic or prognostic marker. Diagnostic and prognostic methods, kits and reagents encompassed by the present invention are briefly described below and more thoroughly elsewhere herein (see e.g., the sections labeled "Antibodies", "Diagnostic Assays", and "Methods for Detecting Diseases").

[333] Thus, the invention also provides a diagnostic method useful during diagnosis of a disorder, involving measuring the expression level of polynucleotides of the present invention in cells or body fluid from an individual and comparing the measured gene expression level with a standard level of polynucleotide expression level, whereby an increase or decrease in the gene expression level compared to the standard is indicative of a disorder. Additional non-limiting examples of diagnostic methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., Example 12).

[334] In still another embodiment, the invention includes a kit for analyzing samples for the presence of proliferative and/or cancerous polynucleotides derived from a test subject. In a general embodiment, the kit includes at least one polynucleotide probe containing a nucleotide sequence that will specifically hybridize with a polynucleotide of the invention and a suitable container. In a specific embodiment, the kit includes two polynucleotide probes defining an internal region of the polynucleotide of the invention, where each probe has one strand containing a 31'-mer-end internal to the region. In a further

embodiment, the probes may be useful as primers for polymerase chain reaction amplification.

[335] Where a diagnosis of a related disorder, including, for example, diagnosis of a tumor, has already been made according to conventional methods, the present invention is useful as a prognostic indicator, whereby patients exhibiting enhanced or depressed polynucleotide of the invention expression will experience a worse clinical outcome relative to patients expressing the gene at a level nearer the standard level.

[336] By "measuring the expression level of polynucleotides of the invention" is intended qualitatively or quantitatively measuring or estimating the level of the polypeptide of the invention or the level of the mRNA encoding the polypeptide of the invention in a first biological sample either directly (e.g., by determining or estimating absolute protein level or mRNA level) or relatively (e.g., by comparing to the polypeptide level or mRNA level in a second biological sample). Preferably, the polypeptide level or mRNA level in the first biological sample is measured or estimated and compared to a standard polypeptide level or mRNA level, the standard being taken from a second biological sample obtained from an individual not having the related disorder or being determined by averaging levels from a population of individuals not having a related disorder. As will be appreciated in the art, once a standard polypeptide level or mRNA level is known, it can be used repeatedly as a standard for comparison.

[337] By "biological sample" is intended any biological sample obtained from an individual, body fluid, cell line, tissue culture, or other source which contains polypeptide of the present invention or the corresponding mRNA. As indicated, biological samples include body fluids (such as semen, lymph, vaginal pool, sera, plasma, urine, synovial fluid and spinal fluid) which contain the polypeptide of the present invention, and tissue sources found to express the polypeptide of the present invention. Methods for obtaining tissue biopsies and body fluids from mammals are well known in the art. Where the biological sample is to include mRNA, a tissue biopsy is the preferred source.

[338] The method(s) provided above may preferably be applied in a diagnostic method and/or kits in which polynucleotides and/or polypeptides of the invention are attached to a solid support. In one exemplary method, the support may be a "gene chip" or a "biological chip" as described in US Patents 5,837,832, 5,874,219, and 5,856,174. Further, such a gene chip with polynucleotides of the invention attached may be used to identify polymorphisms between the isolated polynucleotide sequences of the invention, with polynucleotides

isolated from a test subject. The knowledge of such polymorphisms (i.e. their location, as well as, their existence) would be beneficial in identifying disease loci for many disorders, such as for example, in neural disorders, immune system disorders, muscular disorders, reproductive disorders, gastrointestinal disorders, pulmonary disorders, digestive disorders, metabolic disorders, cardiovascular disorders, renal disorders, proliferative disorders, and/or cancerous diseases and conditions. Such a method is described in US Patents 5,858,659 and 5,856,104. The US Patents referenced *supra* are hereby incorporated by reference in their entirety herein.

[339] The present invention encompasses polynucleotides of the present invention that are chemically synthesized, or reproduced as peptide nucleic acids (PNA), or according to other methods known in the art. The use of PNAs would serve as the preferred form if the polynucleotides of the invention are incorporated onto a solid support, or gene chip. For the purposes of the present invention, a peptide nucleic acid (PNA) is a polyamide type of DNA analog and the monomeric units for adenine, guanine, thymine and cytosine are available commercially (Perceptive Biosystems). Certain components of DNA, such as phosphorus, phosphorus oxides, or deoxyribose derivatives, are not present in PNAs. As disclosed by Nielsen et al., Science 254, 1497 (1991); and Egholm et al., Nature 365, 666 (1993), PNAs bind specifically and tightly to complementary DNA strands and are not degraded by nucleases. In fact, PNA binds more strongly to DNA than DNA itself does. This is probably because there is no electrostatic repulsion between the two strands, and also the polyamide backbone is more flexible. Because of this, PNA/DNA duplexes bind under a wider range of stringency conditions than DNA/DNA duplexes, making it easier to perform multiplex hybridization. Smaller probes can be used than with DNA due to the strong binding. In addition, it is more likely that single base mismatches can be determined with PNA/DNA hybridization because a single mismatch in a PNA/DNA 15-mer lowers the melting point (T_{sub.m}) by 8°-20° C, vs. 4°-16° C for the DNA/DNA 15-mer duplex. Also, the absence of charge groups in PNA means that hybridization can be done at low ionic strengths and reduce possible interference by salt during the analysis.

[340] The compounds of the present invention have uses which include, but are not limited to, detecting cancer in mammals. In particular the invention is useful during diagnosis of pathological cell proliferative neoplasias which include, but are not limited to: acute myelogenous leukemias including acute monocytic leukemia, acute myeloblastic leukemia, acute promyelocytic leukemia, acute myelomonocytic leukemia, acute

erythroleukemia, acute megakaryocytic leukemia, and acute undifferentiated leukemia, etc.; and chronic myelogenous leukemias including chronic myelomonocytic leukemia, chronic granulocytic leukemia, etc. Preferred mammals include monkeys, apes, cats, dogs, cows, pigs, horses, rabbits and humans. Particularly preferred are humans.

[341] Pathological cell proliferative disorders are often associated with inappropriate activation of proto-oncogenes. (Gelmann, E. P. et al., "The Etiology of Acute Leukemia: Molecular Genetics and Viral Oncology," in *Neoplastic Diseases of the Blood*, Vol 1., Wiernik, P. H. et al. eds., 161-182 (1985)). Neoplasias are now believed to result from the qualitative alteration of a normal cellular gene product, or from the quantitative modification of gene expression by insertion into the chromosome of a viral sequence, by chromosomal translocation of a gene to a more actively transcribed region, or by some other mechanism. (Gelmann et al., *supra*) It is likely that mutated or altered expression of specific genes is involved in the pathogenesis of some leukemias, among other tissues and cell types. (Gelmann et al., *supra*) Indeed, the human counterparts of the oncogenes involved in some animal neoplasias have been amplified or translocated in some cases of human leukemia and carcinoma. (Gelmann et al., *supra*)

[342] For example, c-myc expression is highly amplified in the non-lymphocytic leukemia cell line HL-60. When HL-60 cells are chemically induced to stop proliferation, the level of c-myc is found to be downregulated. (International Publication Number WO 91/15580). However, it has been shown that exposure of HL-60 cells to a DNA construct that is complementary to the 5' end of c-myc or c-myb blocks translation of the corresponding mRNAs which downregulates expression of the c-myc or c-myb proteins and causes arrest of cell proliferation and differentiation of the treated cells. (International Publication Number WO 91/15580; Wickstrom et al., *Proc. Natl. Acad. Sci.* 85:1028 (1988); Anfossi et al., *Proc. Natl. Acad. Sci.* 86:3379 (1989)). However, the skilled artisan would appreciate the present invention's usefulness is not be limited to treatment, prevention, and/or prognosis of proliferative disorders of cells and tissues of hematopoietic origin, in light of the numerous cells and cell types of varying origins which are known to exhibit proliferative phenotypes.

[343] In addition to the foregoing, a polynucleotide of the present invention can be used to control gene expression through triple helix formation or through antisense DNA or RNA. Antisense techniques are discussed, for example, in Okano, J. *Neurochem.* 56: 560 (1991); "Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression, CRC Press,

Boca Raton, FL (1988). Triple helix formation is discussed in, for instance Lee et al., Nucleic Acids Research 6: 3073 (1979); Cooney et al., Science 241: 456 (1988); and Dervan et al., Science 251: 1360 (1991). Both methods rely on binding of the polynucleotide to a complementary DNA or RNA. For these techniques, preferred polynucleotides are usually oligonucleotides 20 to 40 bases in length and complementary to either the region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 241:456 (1988); and Dervan et al., Science 251:1360 (1991)) or to the mRNA itself (antisense - Okano, J. Neurochem. 56:560 (1991); Oligodeoxy-nucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988)). Triple helix formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. The oligonucleotide described above can also be delivered to cells such that the antisense RNA or DNA may be expressed *in vivo* to inhibit production of polypeptide of the present invention antigens. Both techniques are effective in model systems, and the information disclosed herein can be used to design antisense or triple helix polynucleotides in an effort to treat disease, and in particular, for the treatment of proliferative diseases and/or conditions. Non-limiting antisense and triple helix methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., the section labeled "Antisense and Ribozyme (Antagonists)").

[344] Polynucleotides of the present invention are also useful in gene therapy. One goal of gene therapy is to insert a normal gene into an organism having a defective gene, in an effort to correct the genetic defect. The polynucleotides disclosed in the present invention offer a means of targeting such genetic defects in a highly accurate manner. Another goal is to insert a new gene that was not present in the host genome, thereby producing a new trait in the host cell. Additional non-limiting examples of gene therapy methods encompassed by the present invention are more thoroughly described elsewhere herein (see, e.g., the sections labeled "Gene Therapy Methods", and Examples 16, 17 and 18).

[345] The polynucleotides are also useful for identifying individuals from minute biological samples. The United States military, for example, is considering the use of restriction fragment length polymorphism (RFLP) for identification of its personnel. In this technique, an individual's genomic DNA is digested with one or more restriction enzymes, and probed on a Southern blot to yield unique bands for identifying personnel. This

method does not suffer from the current limitations of "Dog Tags" which can be lost, switched, or stolen, making positive identification difficult. The polynucleotides of the present invention can be used as additional DNA markers for RFLP.

[346] The polynucleotides of the present invention can also be used as an alternative to RFLP, by determining the actual base-by-base DNA sequence of selected portions of an individual's genome. These sequences can be used to prepare PCR primers for amplifying and isolating such selected DNA, which can then be sequenced. Using this technique, individuals can be identified because each individual will have a unique set of DNA sequences. Once an unique ID database is established for an individual, positive identification of that individual, living or dead, can be made from extremely small tissue samples.

[347] Forensic biology also benefits from using DNA-based identification techniques as disclosed herein. DNA sequences taken from very small biological samples such as tissues, e.g., hair or skin, or body fluids, e.g., blood, saliva, semen, synovial fluid, amniotic fluid, breast milk, lymph, pulmonary sputum or surfactant, urine, fecal matter, etc., can be amplified using PCR. In one prior art technique, gene sequences amplified from polymorphic loci, such as DQa class II HLA gene, are used in forensic biology to identify individuals. (Erich, H., PCR Technology, Freeman and Co. (1992)). Once these specific polymorphic loci are amplified, they are digested with one or more restriction enzymes, yielding an identifying set of bands on a Southern blot probed with DNA corresponding to the DQa class II HLA gene. Similarly, polynucleotides of the present invention can be used as polymorphic markers for forensic purposes.

[348] There is also a need for reagents capable of identifying the source of a particular tissue. Such need arises, for example, in forensics when presented with tissue of unknown origin. Appropriate reagents can comprise, for example, DNA probes or primers prepared from the sequences of the present invention, specific to tissues, including but not limited to those shown in Table 1A. Panels of such reagents can identify tissue by species and/or by organ type. In a similar fashion, these reagents can be used to screen tissue cultures for contamination. Additional non-limiting examples of such uses are further described herein.

[349] The polynucleotides of the present invention are also useful as hybridization probes for differential identification of the tissue(s) or cell type(s) present in a biological sample. Similarly, polypeptides and antibodies directed to polypeptides of the present invention are useful to provide immunological probes for differential identification of the

tissue(s) (e.g., immunohistochemistry assays) or cell type(s) (e.g., immunocytochemistry assays). In addition, for a number of disorders of the above tissues or cells, significantly higher or lower levels of gene expression of the polynucleotides/polypeptides of the present invention may be detected in certain tissues (e.g., tissues expressing polypeptides and/or polynucleotides of the present invention, for example, those disclosed in column 8 of Table 1A, and/or cancerous and/or wounded tissues) or bodily fluids (e.g., semen, lymph, vaginal pool, serum, plasma, urine, synovial fluid or spinal fluid) taken from an individual having such a disorder, relative to a "standard" gene expression level, i.e., the expression level in healthy tissue from an individual not having the disorder.

[350] Thus, the invention provides a diagnostic method of a disorder, which involves: (a) assaying gene expression level in cells or body fluid of an individual; (b) comparing the gene expression level with a standard gene expression level, whereby an increase or decrease in the assayed gene expression level compared to the standard expression level is indicative of a disorder.

[351] In the very least, the polynucleotides of the present invention can be used as molecular weight markers on Southern gels, as diagnostic probes for the presence of a specific mRNA in a particular cell type, as a probe to "subtract-out" known sequences in the process of discovering novel polynucleotides, for selecting and making oligomers for attachment to a "gene chip" or other support, to raise anti-DNA antibodies using DNA immunization techniques, and as an antigen to elicit an immune response.

Uses of the Polypeptides

[352] Each of the polypeptides identified herein can be used in numerous ways. The following description should be considered exemplary and utilizes known techniques.

[353] Polypeptides and antibodies directed to polypeptides of the present invention are useful to provide immunological probes for differential identification of the tissue(s) (e.g., immunohistochemistry assays such as, for example, ABC immunoperoxidase (Hsu et al., J. Histochem. Cytochem. 29:577-580 (1981)) or cell type(s) (e.g., immunocytochemistry assays).

[354] Antibodies can be used to assay levels of polypeptides encoded by polynucleotides of the invention in a biological sample using classical immunohistological methods known to those of skill in the art (e.g., see Jalkanen, et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen, et al., J. Cell. Biol. 105:3087-3096 (1987)). Other antibody-based

methods useful for detecting protein gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase; radioisotopes, such as iodine (^{131}I , ^{125}I , ^{123}I , ^{121}I), carbon (^{14}C), sulfur (^{35}S), tritium (^3H), indium ($^{115\text{m}}\text{In}$, $^{113\text{m}}\text{In}$, ^{112}In , ^{111}In), and technetium (^{99}Tc , $^{99\text{m}}\text{Tc}$), thallium (^{201}Tl), gallium (^{68}Ga , ^{67}Ga), palladium (^{103}Pd), molybdenum (^{99}Mo), xenon (^{133}Xe), fluorine (^{18}F), ^{153}Sm , ^{177}Lu , ^{159}Gd , ^{149}Pm , ^{140}La , ^{175}Yb , ^{166}Ho , ^{90}Y , ^{47}Sc , ^{186}Re , ^{188}Re , ^{142}Pr , ^{105}Rh , ^{97}Ru ; luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin.

[355] In addition to assaying levels of polypeptide of the present invention in a biological sample, proteins can also be detected *in vivo* by imaging. Antibody labels or markers for *in vivo* imaging of protein include those detectable by X-radiography, NMR or ESR. For X-radiography, suitable labels include radioisotopes such as barium or cesium, which emit detectable radiation but are not overtly harmful to the subject. Suitable markers for NMR and ESR include those with a detectable characteristic spin, such as deuterium, which may be incorporated into the antibody by labeling of nutrients for the relevant hybridoma.

[356] A protein-specific antibody or antibody fragment which has been labeled with an appropriate detectable imaging moiety, such as a radioisotope (for example, ^{131}I , ^{112}In , $^{99\text{m}}\text{Tc}$, (^{131}I , ^{125}I , ^{123}I , ^{121}I), carbon (^{14}C), sulfur (^{35}S), tritium (^3H), indium ($^{115\text{m}}\text{In}$, $^{113\text{m}}\text{In}$, ^{112}In , ^{111}In), and technetium (^{99}Tc , $^{99\text{m}}\text{Tc}$), thallium (^{201}Tl), gallium (^{68}Ga , ^{67}Ga), palladium (^{103}Pd), molybdenum (^{99}Mo), xenon (^{133}Xe), fluorine (^{18}F , ^{153}Sm , ^{177}Lu , ^{159}Gd , ^{149}Pm , ^{140}La , ^{175}Yb , ^{166}Ho , ^{90}Y , ^{47}Sc , ^{186}Re , ^{188}Re , ^{142}Pr , ^{105}Rh , ^{97}Ru), a radio-opaque substance, or a material detectable by nuclear magnetic resonance, is introduced (for example, parenterally, subcutaneously or intraperitoneally) into the mammal to be examined for immune system disorder. It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of $^{99\text{m}}\text{Tc}$. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which express the polypeptide encoded by a polynucleotide of the invention. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments" (Chapter 13 in *Tumor Imaging: The Radiochemical*

Detection of Cancer, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

[357] In one embodiment, the invention provides a method for the specific delivery of compositions of the invention to cells by administering polypeptides of the invention (e.g., polypeptides encoded by polynucleotides of the invention and/or antibodies) that are associated with heterologous polypeptides or nucleic acids. In one example, the invention provides a method for delivering a therapeutic protein into the targeted cell. In another example, the invention provides a method for delivering a single stranded nucleic acid (e.g., antisense or ribozymes) or double stranded nucleic acid (e.g., DNA that can integrate into the cell's genome or replicate episomally and that can be transcribed) into the targeted cell.

[358] In another embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention in association with toxins or cytotoxic prodrugs.

[359] By "toxin" is meant one or more compounds that bind and activate endogenous cytotoxic effector systems, radioisotopes, holotoxins, modified toxins, catalytic subunits of toxins, or any molecules or enzymes not normally present in or on the surface of a cell that under defined conditions cause the cell's death. Toxins that may be used according to the methods of the invention include, but are not limited to, radioisotopes known in the art, compounds such as, for example, antibodies (or complement fixing containing portions thereof) that bind an inherent or induced endogenous cytotoxic effector system, thymidine kinase, endonuclease, RNase, alpha toxin, ricin, abrin, *Pseudomonas* exotoxin A, diphtheria toxin, saporin, momordin, gelonin, pokeweed antiviral protein, alpha-sarcin and cholera toxin. "Toxin" also includes a cytostatic or cytocidal agent, a therapeutic agent or a radioactive metal ion, e.g., alpha-emitters such as, for example, ^{213}Bi , or other radioisotopes such as, for example, ^{103}Pd , ^{133}Xe , ^{131}I , ^{68}Ge , ^{57}Co , ^{65}Zn , ^{85}Sr , ^{32}P , ^{35}S , ^{90}Y , ^{153}Sm , ^{153}Gd , ^{169}Yb , ^{51}Cr , ^{54}Mn , ^{75}Se , ^{113}Sn , $^{90}\text{Yttrium}$, ^{117}Tin , $^{186}\text{Rhenium}$, $^{166}\text{Holmium}$, and $^{188}\text{Rhenium}$; luminescent labels, such as luminol; and fluorescent labels, such as fluorescein and rhodamine, and biotin. In a specific embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the radioisotope ^{90}Y . In another specific embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the

radioisotope ^{111}In . In a further specific embodiment, the invention provides a method for the specific destruction of cells (e.g., the destruction of tumor cells) by administering polypeptides of the invention or antibodies of the invention in association with the radioisotope ^{131}I .

[360] Techniques known in the art may be applied to label polypeptides of the invention (including antibodies). Such techniques include, but are not limited to, the use of bifunctional conjugating agents (see e.g., U.S. Patent Nos. 5,756,065; 5,714,631; 5,696,239; 5,652,361; 5,505,931; 5,489,425; 5,435,990; 5,428,139; 5,342,604; 5,274,119; 4,994,560; and 5,808,003; the contents of each of which are hereby incorporated by reference in its entirety).

[361] Thus, the invention provides a diagnostic method of a disorder, which involves (a) assaying the expression level of a polypeptide of the present invention in cells or body fluid of an individual; and (b) comparing the assayed polypeptide expression level with a standard polypeptide expression level, whereby an increase or decrease in the assayed polypeptide expression level compared to the standard expression level is indicative of a disorder. With respect to cancer, the presence of a relatively high amount of transcript in biopsied tissue from an individual may indicate a predisposition for the development of the disease, or may provide a means for detecting the disease prior to the appearance of actual clinical symptoms. A more definitive diagnosis of this type may allow health professionals to employ preventative measures or aggressive treatment earlier thereby preventing the development or further progression of the cancer.

[362] Moreover, polypeptides of the present invention can be used to treat or prevent diseases or conditions such as, for example, neural disorders, immune system disorders, muscular disorders, reproductive disorders, gastrointestinal disorders, pulmonary disorders, cardiovascular disorders, renal disorders, proliferative disorders, and/or cancerous diseases and conditions. For example, patients can be administered a polypeptide of the present invention in an effort to replace absent or decreased levels of the polypeptide (e.g., insulin), to supplement absent or decreased levels of a different polypeptide (e.g., hemoglobin S for hemoglobin B, SOD, catalase, DNA repair proteins), to inhibit the activity of a polypeptide (e.g., an oncogene or tumor suppressor), to activate the activity of a polypeptide (e.g., by binding to a receptor), to reduce the activity of a membrane bound receptor by competing with it for free ligand (e.g., soluble TNF receptors used in reducing inflammation), or to

bring about a desired response (e.g., blood vessel growth inhibition, enhancement of the immune response to proliferative cells or tissues).

[363] Similarly, antibodies directed to a polypeptide of the present invention can also be used to treat disease (as described *supra*, and elsewhere herein). For example, administration of an antibody directed to a polypeptide of the present invention can bind, and/or neutralize the polypeptide, and/or reduce overproduction of the polypeptide. Similarly, administration of an antibody can activate the polypeptide, such as by binding to a polypeptide bound to a membrane (receptor).

[364] At the very least, the polypeptides of the present invention can be used as molecular weight markers on SDS-PAGE gels or on molecular sieve gel filtration columns using methods well known to those of skill in the art. Polypeptides can also be used to raise antibodies, which in turn are used to measure protein expression from a recombinant cell, as a way of assessing transformation of the host cell. Moreover, the polypeptides of the present invention can be used to test the biological activities described herein.

Diagnostic Assays

[365] The compounds of the present invention are useful for diagnosis, treatment, prevention and/or prognosis of various disorders in mammals, preferably humans. Such disorders include, but are not limited to, those described herein under the section heading "Biological Activities".

[366] For a number of disorders, substantially altered (increased or decreased) levels of gene expression can be detected in tissues, cells or bodily fluids (e.g., sera, plasma, urine, semen, synovial fluid or spinal fluid) taken from an individual having such a disorder, relative to a "standard" gene expression level, that is, the expression level in tissues or bodily fluids from an individual not having the disorder. Thus, the invention provides a diagnostic method useful during diagnosis of a disorder, which involves measuring the expression level of the gene encoding the polypeptide in tissues, cells or body fluid from an individual and comparing the measured gene expression level with a standard gene expression level, whereby an increase or decrease in the gene expression level(s) compared to the standard is indicative of a disorder. These diagnostic assays may be performed *in vivo* or *in vitro*, such as, for example, on blood samples, biopsy tissue or autopsy tissue.

[367] The present invention is also useful as a prognostic indicator, whereby patients exhibiting enhanced or depressed gene expression will experience a worse clinical outcome

relative to patients expressing the gene at a level nearer the standard level.

[368] In certain embodiments, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to diagnose and/or prognose diseases and/or disorders associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1A, column 8 (Tissue Distribution Library Code).

[369] By "assaying the expression level of the gene encoding the polypeptide" is intended qualitatively or quantitatively measuring or estimating the level of the polypeptide of the invention or the level of the mRNA encoding the polypeptide of the invention in a first biological sample either directly (e.g., by determining or estimating absolute protein level or mRNA level) or relatively (e.g., by comparing to the polypeptide level or mRNA level in a second biological sample). Preferably, the polypeptide expression level or mRNA level in the first biological sample is measured or estimated and compared to a standard polypeptide level or mRNA level, the standard being taken from a second biological sample obtained from an individual not having the disorder or being determined by averaging levels from a population of individuals not having the disorder. As will be appreciated in the art, once a standard polypeptide level or mRNA level is known, it can be used repeatedly as a standard for comparison.

[370] By "biological sample" is intended any biological sample obtained from an individual, cell line, tissue culture, or other source containing polypeptides of the invention (including portions thereof) or mRNA. As indicated, biological samples include body fluids (such as sera, plasma, urine, synovial fluid and spinal fluid) and tissue sources found to express the full length or fragments thereof of a polypeptide or mRNA. Methods for obtaining tissue biopsies and body fluids from mammals are well known in the art. Where the biological sample is to include mRNA, a tissue biopsy is the preferred source.

[371] Total cellular RNA can be isolated from a biological sample using any suitable technique such as the single-step guanidinium-thiocyanate-phenol-chloroform method described in Chomczynski and Sacchi, *Anal. Biochem.* 162:156-159 (1987). Levels of mRNA encoding the polypeptides of the invention are then assayed using any appropriate method. These include Northern blot analysis, S1 nuclease mapping, the polymerase chain reaction (PCR), reverse transcription in combination with the polymerase chain reaction (RT-PCR), and reverse transcription in combination with the ligase chain reaction (RT-LCR).

[372] The present invention also relates to diagnostic assays such as quantitative and diagnostic assays for detecting levels of polypeptides of the invention, in a biological sample (e.g., cells and tissues), including determination of normal and abnormal levels of polypeptides. Thus, for instance, a diagnostic assay in accordance with the invention for detecting over-expression of polypeptides of the invention compared to normal control tissue samples may be used to detect the presence of tumors. Assay techniques that can be used to determine levels of a polypeptide, such as a polypeptide of the present invention in a sample derived from a host are well-known to those of skill in the art. Such assay methods include radioimmunoassays, competitive-binding assays, Western Blot analysis and ELISA assays. Assaying polypeptide levels in a biological sample can occur using any art-known method.

[373] Assaying polypeptide levels in a biological sample can occur using antibody-based techniques. For example, polypeptide expression in tissues can be studied with classical immunohistological methods (Jalkanen et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen, M., et al., J. Cell . Biol. 105:3087-3096 (1987)). Other antibody-based methods useful for detecting polypeptide gene expression include immunoassays, such as the enzyme linked immunosorbent assay (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase, and radioisotopes, such as iodine (^{125}I , ^{121}I), carbon (^{14}C), sulfur (^{35}S), tritium (^3H), indium (^{112}In), and technetium ($^{99\text{m}}\text{Tc}$), and fluorescent labels, such as fluorescein and rhodamine, and biotin.

[374] The tissue or cell type to be analyzed will generally include those which are known, or suspected, to express the gene of interest (such as, for example, cancer). The protein isolation methods employed herein may, for example, be such as those described in Harlow and Lane (Harlow, E. and Lane, D., 1988, "Antibodies: A Laboratory Manual", Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York), which is incorporated herein by reference in its entirety. The isolated cells can be derived from cell culture or from a patient. The analysis of cells taken from culture may be a necessary step in the assessment of cells that could be used as part of a cell-based gene therapy technique or, alternatively, to test the effect of compounds on the expression of the gene.

[375] For example, antibodies, or fragments of antibodies, such as those described herein, may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example,

by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric detection.

[376] In a preferred embodiment, antibodies, or fragments of antibodies directed to any one or all of the predicted epitope domains of the polypeptides of the invention (shown in column 7 of Table 1A) may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example, by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric detection.

[377] In an additional preferred embodiment, antibodies, or fragments of antibodies directed to a conformational epitope of a polypeptide of the invention may be used to quantitatively or qualitatively detect the presence of gene products or conserved variants or peptide fragments thereof. This can be accomplished, for example, by immunofluorescence techniques employing a fluorescently labeled antibody coupled with light microscopic, flow cytometric, or fluorimetric detection.

[378] The antibodies (or fragments thereof), and/or polypeptides of the present invention may, additionally, be employed histologically, as in immunofluorescence, immunoelectron microscopy or non-immunological assays, for in situ detection of gene products or conserved variants or peptide fragments thereof. In situ detection may be accomplished by removing a histological specimen from a patient, and applying thereto a labeled antibody or polypeptide of the present invention. The antibody (or fragment thereof) or polypeptide is preferably applied by overlaying the labeled antibody (or fragment) onto a biological sample. Through the use of such a procedure, it is possible to determine not only the presence of the gene product, or conserved variants or peptide fragments, or polypeptide binding, but also its distribution in the examined tissue. Using the present invention, those of ordinary skill will readily perceive that any of a wide variety of histological methods (such as staining procedures) can be modified in order to achieve such in situ detection.

[379] Immunoassays and non-immunoassays for gene products or conserved variants or peptide fragments thereof will typically comprise incubating a sample, such as a biological fluid, a tissue extract, freshly harvested cells, or lysates of cells which have been incubated in cell culture, in the presence of a detectably labeled antibody capable of binding gene products or conserved variants or peptide fragments thereof, and detecting the bound antibody by any of a number of techniques well-known in the art.

[380] The biological sample may be brought in contact with and immobilized onto a solid phase support or carrier such as nitrocellulose, or other solid support which is capable of immobilizing cells, cell particles or soluble proteins. The support may then be washed with suitable buffers followed by treatment with the detectably labeled antibody or detectable polypeptide of the invention. The solid phase support may then be washed with the buffer a second time to remove unbound antibody or polypeptide. Optionally the antibody is subsequently labeled. The amount of bound label on solid support may then be detected by conventional means.

[381] By "solid phase support or carrier" is intended any support capable of binding an antigen or an antibody. Well-known supports or carriers include glass, polystyrene, polypropylene, polyethylene, dextran, nylon, amylases, natural and modified celluloses, polyacrylamides, gabbros, and magnetite. The nature of the carrier can be either soluble to some extent or insoluble for the purposes of the present invention. The support material may have virtually any possible structural configuration so long as the coupled molecule is capable of binding to an antigen or antibody. Thus, the support configuration may be spherical, as in a bead, or cylindrical, as in the inside surface of a test tube, or the external surface of a rod. Alternatively, the surface may be flat such as a sheet, test strip, etc. Preferred supports include polystyrene beads. Those skilled in the art will know many other suitable carriers for binding antibody or antigen, or will be able to ascertain the same by use of routine experimentation.

[382] The binding activity of a given lot of antibody or antigen polypeptide may be determined according to well known methods. Those skilled in the art will be able to determine operative and optimal assay conditions for each determination by employing routine experimentation.

[383] In addition to assaying polypeptide levels or polynucleotide levels in a biological sample obtained from an individual, polypeptide or polynucleotide can also be detected *in vivo* by imaging. For example, in one embodiment of the invention, polypeptides and/or antibodies of the invention are used to image diseased cells, such as neoplasms. In another embodiment, polynucleotides of the invention (e.g., polynucleotides complementary to all or a portion of an mRNA) and/or antibodies (e.g., antibodies directed to any one or a combination of the epitopes of a polypeptide of the invention, antibodies directed to a conformational epitope of a polypeptide of the invention, or antibodies directed to the full length polypeptide expressed on the cell surface of a mammalian cell) are used to image

diseased or neoplastic cells.

[384] Antibody labels or markers for *in vivo* imaging of polypeptides of the invention include those detectable by X-radiography, NMR, MRI, CAT-scans or ESR. For X-radiography, suitable labels include radioisotopes such as barium or cesium, which emit detectable radiation but are not overtly harmful to the subject. Suitable markers for NMR and ESR include those with a detectable characteristic spin, such as deuterium, which may be incorporated into the antibody by labeling of nutrients for the relevant hybridoma. Where *in vivo* imaging is used to detect enhanced levels of polypeptides for diagnosis in humans, it may be preferable to use human antibodies or "humanized" chimeric monoclonal antibodies. Such antibodies can be produced using techniques described herein or otherwise known in the art. For example methods for producing chimeric antibodies are known in the art. See, for review, Morrison, *Science* 229:1202 (1985); Oi et al., *BioTechniques* 4:214 (1986); Cabilly et al., U.S. Patent No. 4,816,567; Taniguchi et al., EP 171496; Morrison et al., EP 173494; Neuberger et al., WO 8601533; Robinson et al., WO 8702671; Boulianne et al., *Nature* 312:643 (1984); Neuberger et al., *Nature* 314:268 (1985).

[385] Additionally, any polypeptides of the invention whose presence can be detected, can be administered. For example, polypeptides of the invention labeled with a radio-opaque or other appropriate compound can be administered and visualized *in vivo*, as discussed, above for labeled antibodies. Further, such polypeptides can be utilized for *in vitro* diagnostic procedures.

[386] A polypeptide-specific antibody or antibody fragment which has been labeled with an appropriate detectable imaging moiety, such as a radioisotope (for example, ^{131}I , ^{112}In , $^{99\text{m}}\text{Tc}$), a radio-opaque substance, or a material detectable by nuclear magnetic resonance, is introduced (for example, parenterally, subcutaneously or intraperitoneally) into the mammal to be examined for a disorder. It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of $^{99\text{m}}\text{Tc}$. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which contain the antigenic protein. *In vivo* tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments" (Chapter 13 in *Tumor Imaging: The Radiochemical*

Detection of Cancer, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982)).

[387] With respect to antibodies, one of the ways in which an antibody of the present invention can be detectably labeled is by linking the same to a reporter enzyme and using the linked product in an enzyme immunoassay (EIA) (Voller, A., "The Enzyme Linked Immunosorbent Assay (ELISA)", 1978, Diagnostic Horizons 2:1-7, Microbiological Associates Quarterly Publication, Walkersville, MD); Voller et al., *J. Clin. Pathol.* 31:507-520 (1978); Butler, J.E., *Meth. Enzymol.* 73:482-523 (1981); Maggio, E. (ed.), 1980, *Enzyme Immunoassay*, CRC Press, Boca Raton, FL.; Ishikawa, E. et al., (eds.), 1981, *Enzyme Immunoassay*, Kigaku Shoin, Tokyo). The reporter enzyme which is bound to the antibody will react with an appropriate substrate, preferably a chromogenic substrate, in such a manner as to produce a chemical moiety which can be detected, for example, by spectrophotometric, fluorimetric or by visual means. Reporter enzymes which can be used to detectably label the antibody include, but are not limited to, malate dehydrogenase, staphylococcal nuclease, delta-5-steroid isomerase, yeast alcohol dehydrogenase, alpha-glycerophosphate dehydrogenase, triose phosphate isomerase, horseradish peroxidase, alkaline phosphatase, asparaginase, glucose oxidase, beta-galactosidase, ribonuclease, urease, catalase, glucose-6-phosphate dehydrogenase, glucoamylase and acetylcholinesterase. Additionally, the detection can be accomplished by colorimetric methods which employ a chromogenic substrate for the reporter enzyme. Detection may also be accomplished by visual comparison of the extent of enzymatic reaction of a substrate in comparison with similarly prepared standards.

[388] Detection may also be accomplished using any of a variety of other immunoassays. For example, by radioactively labeling the antibodies or antibody fragments, it is possible to detect polypeptides through the use of a radioimmunoassay (RIA) (see, for example, Weintraub, B., *Principles of Radioimmunoassays*, Seventh Training Course on Radioligand Assay Techniques, The Endocrine Society, March, 1986, which is incorporated by reference herein). The radioactive isotope can be detected by means including, but not limited to, a gamma counter, a scintillation counter, or autoradiography.

[389] It is also possible to label the antibody with a fluorescent compound. When the fluorescently labeled antibody is exposed to light of the proper wave length, its presence can then be detected due to fluorescence. Among the most commonly used fluorescent

labeling compounds are fluorescein isothiocyanate, rhodamine, phycoerythrin, phycocyanin, allophycocyanin, ophthaldehyde and fluorescamine.

[390] The antibody can also be detectably labeled using fluorescence emitting metals such as ^{152}Eu , or others of the lanthanide series. These metals can be attached to the antibody using such metal chelating groups as diethylenetriaminepentaacetic acid (DTPA) or ethylenediaminetetraacetic acid (EDTA).

[391] The antibody also can be detectably labeled by coupling it to a chemiluminescent compound. The presence of the chemiluminescent-tagged antibody is then determined by detecting the presence of luminescence that arises during the course of a chemical reaction. Examples of particularly useful chemiluminescent labeling compounds are luminol, isoluminol, therrromatic acridinium ester, imidazole, acridinium salt and oxalate ester.

[392] Likewise, a bioluminescent compound may be used to label the antibody of the present invention. Bioluminescence is a type of chemiluminescence found in biological systems in, which a catalytic protein increases the efficiency of the chemiluminescent reaction. The presence of a bioluminescent protein is determined by detecting the presence of luminescence. Important bioluminescent compounds for purposes of labeling are luciferin, luciferase and aequorin.

Methods for Detecting Diseases

[393] In general, a disease may be detected in a patient based on the presence of one or more proteins of the invention and/or polynucleotides encoding such proteins in a biological sample (for example, blood, sera, urine, and/or tumor biopsies) obtained from the patient. In other words, such proteins may be used as markers to indicate the presence or absence of a disease or disorder, including cancer and/or as described elsewhere herein. In addition, such proteins may be useful for the detection of other diseases and cancers. The binding agents provided herein generally permit detection of the level of antigen that binds to the agent in the biological sample. Polynucleotide primers and probes may be used to detect the level of mRNA encoding polypeptides of the invention, which is also indicative of the presence or absence of a disease or disorder, including cancer. In general, polypeptides of the invention should be present at a level that is at least three fold higher in diseased tissue than in normal tissue.

[394] There are a variety of assay formats known to those of ordinary skill in the art for using a binding agent to detect polypeptide markers in a sample. See, e.g., Harlow and

Lane, *supra*. In general, the presence or absence of a disease in a patient may be determined by (a) contacting a biological sample obtained from a patient with a binding agent; (b) detecting in the sample a level of polypeptide that binds to the binding agent; and (c) comparing the level of polypeptide with a predetermined cut-off value.

[395] In a preferred embodiment, the assay involves the use of a binding agent(s) immobilized on a solid support to bind to and remove the polypeptide of the invention from the remainder of the sample. The bound polypeptide may then be detected using a detection reagent that contains a reporter group and specifically binds to the binding agent/polypeptide complex. Such detection reagents may comprise, for example, a binding agent that specifically binds to the polypeptide or an antibody or other agent that specifically binds to the binding agent, such as an anti-immunoglobulin, protein G, protein A or a lectin. Alternatively, a competitive assay may be utilized, in which a polypeptide is labeled with a reporter group and allowed to bind to the immobilized binding agent after incubation of the binding agent with the sample. The extent to which components of the sample inhibit the binding of the labeled polypeptide to the binding agent is indicative of the reactivity of the sample with the immobilized binding agent. Suitable polypeptides for use within such assays include polypeptides of the invention and portions thereof, or antibodies, to which the binding agent binds, as described above.

[396] The solid support may be any material known to those of skill in the art to which polypeptides of the invention may be attached. For example, the solid support may be a test well in a microtiter plate or a nitrocellulose or other suitable membrane. Alternatively, the support may be a bead or disc, such as glass fiberglass, latex or a plastic material such as polystyrene or polyvinylchloride. The support may also be a magnetic particle or a fiber optic sensor, such as those disclosed, for example, in U.S. Patent No. 5,359,681. The binding agent may be immobilized on the solid support using a variety of techniques known to those of skill in the art, which are amply described in the patent and scientific literature. In the context of the present invention, the term "immobilization" refers to both noncovalent association, such as adsorption, and covalent attachment (which may be a direct linkage between the agent and functional groups on the support or may be a linkage by way of a cross-linking agent). Immobilization by adsorption to a well in a microtiter plate or to a membrane is preferred. In such cases, adsorption may be achieved by contacting the binding agent, in a suitable buffer, with the solid support for the suitable amount of time. The contact time varies with temperature, but is typically between about 1

hour and about 1 day. In general, contacting a well of plastic microtiter plate (such as polystyrene or polyvinylchloride) with an amount of binding agent ranging from about 10 ng to about 10 ug, and preferably about 100 ng to about 1 ug, is sufficient to immobilize an adequate amount of binding agent.

[397] Covalent attachment of binding agent to a solid support may generally be achieved by first reacting the support with a bifunctional reagent that will react with both the support and a functional group, such as a hydroxyl or amino group, on the binding agent. For example, the binding agent may be covalently attached to supports having an appropriate polymer coating using benzoquinone or by condensation of an aldehyde group on the support with an amine and an active hydrogen on the binding partner (see, e.g., Pierce Immunotechnology Catalog and Handbook, 1991, at A12-A13).

Gene Therapy Methods

[398] Also encompassed by the invention are gene therapy methods for treating or preventing disorders, diseases and conditions. The gene therapy methods relate to the introduction of nucleic acid (DNA, RNA and antisense DNA or RNA) sequences into an animal to achieve expression of the polypeptide of the present invention. This method requires a polynucleotide which codes for a polypeptide of the present invention operatively linked to a promoter and any other genetic elements necessary for the expression of the polypeptide by the target tissue. Such gene therapy and delivery techniques are known in the art, see, for example, WO90/11092, which is herein incorporated by reference.

[399] Thus, for example, cells from a patient may be engineered with a polynucleotide (DNA or RNA) comprising a promoter operably linked to a polynucleotide of the present invention ex vivo, with the engineered cells then being provided to a patient to be treated with the polypeptide of the present invention. Such methods are well-known in the art. For example, see Belldgrun, A., et al., J. Natl. Cancer Inst. 85: 207-216 (1993); Ferrantini, M. et al., Cancer Research 53: 1107-1112 (1993); Ferrantini, M. et al., J. Immunology 153: 4604-4615 (1994); Kaido, T., et al., Int. J. Cancer 60: 221-229 (1995); Ogura, H., et al., Cancer Research 50: 5102-5106 (1990); Santodonato, L., et al., Human Gene Therapy 7:1-10 (1996); Santodonato, L., et al., Gene Therapy 4:1246-1255 (1997); and Zhang, J.-F. et al., Cancer Gene Therapy 3: 31-38 (1996)), which are herein incorporated by reference. In one embodiment, the cells which are engineered are arterial cells. The arterial cells may be

reintroduced into the patient through direct injection to the artery, the tissues surrounding the artery, or through catheter injection.

[400] As discussed in more detail below, the polynucleotide constructs can be delivered by any method that delivers injectable materials to the cells of an animal, such as, injection into the interstitial space of tissues (heart, muscle, skin, lung, liver, and the like). The polynucleotide constructs may be delivered in a pharmaceutically acceptable liquid or aqueous carrier.

[401] In one embodiment, the polynucleotide of the present invention is delivered as a naked polynucleotide. The term "naked" polynucleotide, DNA or RNA refers to sequences that are free from any delivery vehicle that acts to assist, promote or facilitate entry into the cell, including viral sequences, viral particles, liposome formulations, lipofectin or precipitating agents and the like. However, the polynucleotide of the present invention can also be delivered in liposome formulations and lipofectin formulations and the like can be prepared by methods well known to those skilled in the art. Such methods are described, for example, in U.S. Patent Nos. 5,593,972, 5,589,466, and 5,580,859, which are herein incorporated by reference.

[402] The polynucleotide vector constructs used in the gene therapy method are preferably constructs that will not integrate into the host genome nor will they contain sequences that allow for replication. Appropriate vectors include pWLNEO, pSV2CAT, pOG44, pXT1 and pSG available from Stratagene; pSVK3, pBPV, pMSG and pSVL available from Pharmacia; and pEF1/V5, pcDNA3.1, and pRc/CMV2 available from Invitrogen. Other suitable vectors will be readily apparent to the skilled artisan.

[403] Any strong promoter known to those skilled in the art can be used for driving the expression of the polynucleotide sequence. Suitable promoters include adenoviral promoters, such as the adenoviral major late promoter; or heterologous promoters, such as the cytomegalovirus (CMV) promoter; the respiratory syncytial virus (RSV) promoter; inducible promoters, such as the MMT promoter, the metallothionein promoter; heat shock promoters; the albumin promoter; the ApoAI promoter; human globin promoters; viral thymidine kinase promoters, such as the Herpes Simplex thymidine kinase promoter; retroviral LTRs; the b-actin promoter; and human growth hormone promoters. The promoter also may be the native promoter for the polynucleotide of the present invention.

[404] Unlike other gene therapy techniques, one major advantage of introducing naked nucleic acid sequences into target cells is the transitory nature of the polynucleotide

synthesis in the cells. Studies have shown that non-replicating DNA sequences can be introduced into cells to provide production of the desired polypeptide for periods of up to six months.

[405] The polynucleotide construct can be delivered to the interstitial space of tissues within the an animal, including of muscle, skin, brain, lung, liver, spleen, bone marrow, thymus, heart, lymph, blood, bone, cartilage, pancreas, kidney, gall bladder, stomach, intestine, testis, ovary, uterus, rectum, nervous system, eye, gland, and connective tissue. Interstitial space of the tissues comprises the intercellular, fluid, mucopolysaccharide matrix among the reticular fibers of organ tissues, elastic fibers in the walls of vessels or chambers, collagen fibers of fibrous tissues, or that same matrix within connective tissue ensheathing muscle cells or in the lacunae of bone. It is similarly the space occupied by the plasma of the circulation and the lymph fluid of the lymphatic channels. Delivery to the interstitial space of muscle tissue is preferred for the reasons discussed below. They may be conveniently delivered by injection into the tissues comprising these cells. They are preferably delivered to and expressed in persistent, non-dividing cells which are differentiated, although delivery and expression may be achieved in non-differentiated or less completely differentiated cells, such as, for example, stem cells of blood or skin fibroblasts. *In vivo* muscle cells are particularly competent in their ability to take up and express polynucleotides.

[406] For the naked nucleic acid sequence injection, an effective dosage amount of DNA or RNA will be in the range of from about 0.05 mg/kg body weight to about 50 mg/kg body weight. Preferably the dosage will be from about 0.005 mg/kg to about 20 mg/kg and more preferably from about 0.05 mg/kg to about 5 mg/kg. Of course, as the artisan of ordinary skill will appreciate, this dosage will vary according to the tissue site of injection. The appropriate and effective dosage of nucleic acid sequence can readily be determined by those of ordinary skill in the art and may depend on the condition being treated and the route of administration.

[407] The preferred route of administration is by the parenteral route of injection into the interstitial space of tissues. However, other parenteral routes may also be used, such as, inhalation of an aerosol formulation particularly for delivery to lungs or bronchial tissues, throat or mucous membranes of the nose. In addition, naked DNA constructs can be delivered to arteries during angioplasty by the catheter used in the procedure.

[408] The naked polynucleotides are delivered by any method known in the art, including, but not limited to, direct needle injection at the delivery site, intravenous

injection, topical administration, catheter infusion, and so-called "gene guns". These delivery methods are known in the art.

[409] The constructs may also be delivered with delivery vehicles such as viral sequences, viral particles, liposome formulations, lipofectin, precipitating agents, etc. Such methods of delivery are known in the art.

[410] In certain embodiments, the polynucleotide constructs are complexed in a liposome preparation. Liposomal preparations for use in the instant invention include cationic (positively charged), anionic (negatively charged) and neutral preparations. However, cationic liposomes are particularly preferred because a tight charge complex can be formed between the cationic liposome and the polyanionic nucleic acid. Cationic liposomes have been shown to mediate intracellular delivery of plasmid DNA (Felgner et al., Proc. Natl. Acad. Sci. USA (1987) 84:7413-7416, which is herein incorporated by reference); mRNA (Malone et al., Proc. Natl. Acad. Sci. USA (1989) 86:6077-6081, which is herein incorporated by reference); and purified transcription factors (Debs et al., J. Biol. Chem. (1990) 265:10189-10192, which is herein incorporated by reference), in functional form.

[411] Cationic liposomes are readily available. For example, N[1-2,3-dioleoyloxy)propyl]-N,N,N-triethylammonium (DOTMA) liposomes are particularly useful and are available under the trademark Lipofectin, from GIBCO BRL, Grand Island, N.Y. (See, also, Felgner et al., Proc. Natl. Acad. Sci. USA (1987) 84:7413-7416, which is herein incorporated by reference). Other commercially available liposomes include transfectace (DDAB/DOPE) and DOTAP/DOPE (Boehringer).

[412] Other cationic liposomes can be prepared from readily available materials using techniques well known in the art. See, e.g. PCT Publication No. WO 90/11092 (which is herein incorporated by reference) for a description of the synthesis of DOTAP (1,2-bis(oleoyloxy)-3-(trimethylammonio)propane) liposomes. Preparation of DOTMA liposomes is explained in the literature, see, e.g., P. Felgner et al., Proc. Natl. Acad. Sci. USA 84:7413-7417, which is herein incorporated by reference. Similar methods can be used to prepare liposomes from other cationic lipid materials.

[413] Similarly, anionic and neutral liposomes are readily available, such as from Ayanti Polar Lipids (Birmingham, Ala.), or can be easily prepared using readily available materials. Such materials include phosphatidyl, choline, cholesterol, phosphatidyl ethanolamine, dioleoylphosphatidyl choline (DOPC), dioleoylphosphatidyl glycerol

(DOPG), dioleoylphosphatidyl ethanolamine (DOPE), among others. These materials can also be mixed with the DOTMA and DOTAP starting materials in appropriate ratios. Methods for making liposomes using these materials are well known in the art.

[414] For example, commercially dioleoylphosphatidyl choline (DOPC), dioleoylphosphatidyl glycerol (DOPG), and dioleoylphosphatidyl ethanolamine (DOPE) can be used in various combinations to make conventional liposomes, with or without the addition of cholesterol. Thus, for example, DOPG/DOPC vesicles can be prepared by drying 50 mg each of DOPG and DOPC under a stream of nitrogen gas into a sonication vial. The sample is placed under a vacuum pump overnight and is hydrated the following day with deionized water. The sample is then sonicated for 2 hours in a capped vial, using a Heat Systems model 350 sonicator equipped with an inverted cup (bath type) probe at the maximum setting while the bath is circulated at 15EC. Alternatively, negatively charged vesicles can be prepared without sonication to produce multilamellar vesicles or by extrusion through nucleopore membranes to produce unilamellar vesicles of discrete size. Other methods are known and available to those of skill in the art.

[415] The liposomes can comprise multilamellar vesicles (MLVs), small unilamellar vesicles (SUVs), or large unilamellar vesicles (LUVs), with SUVs being preferred. The various liposome-nucleic acid complexes are prepared using methods well known in the art. See, e.g., Straubinger et al., *Methods of Immunology* (1983), 101:512-527, which is herein incorporated by reference. For example, MLVs containing nucleic acid can be prepared by depositing a thin film of phospholipid on the walls of a glass tube and subsequently hydrating with a solution of the material to be encapsulated. SUVs are prepared by extended sonication of MLVs to produce a homogeneous population of unilamellar liposomes. The material to be entrapped is added to a suspension of preformed MLVs and then sonicated. When using liposomes containing cationic lipids, the dried lipid film is resuspended in an appropriate solution such as sterile water or an isotonic buffer solution such as 10 mM Tris/NaCl, sonicated, and then the preformed liposomes are mixed directly with the DNA. The liposome and DNA form a very stable complex due to binding of the positively charged liposomes to the cationic DNA. SUVs find use with small nucleic acid fragments. LUVs are prepared by a number of methods, well known in the art. Commonly used methods include Ca^{2+} -EDTA chelation (Papahadjopoulos et al., *Biochim. Biophys. Acta* (1975) 394:483; Wilson et al., *Cell* 17:77 (1979)); ether injection (Deamer, D. and Bangham, A., *Biochim. Biophys. Acta* 443:629 (1976); Ostro et al., *Biochem. Biophys.*

Res. Commun. 76:836 (1977); Fraley et al., Proc. Natl. Acad. Sci. USA 76:3348 (1979)); detergent dialysis (Enoch, H. and Strittmatter, P., Proc. Natl. Acad. Sci. USA 76:145 (1979)); and reverse-phase evaporation (REV) (Fraley et al., J. Biol. Chem. 255:10431 (1980); Szoka, F. and Papahadjopoulos, D., Proc. Natl. Acad. Sci. USA 75:145 (1978); Schaefer-Ridder et al., Science 215:166 (1982)), which are herein incorporated by reference.

[416] Generally, the ratio of DNA to liposomes will be from about 10:1 to about 1:10. Preferably, the ration will be from about 5:1 to about 1:5. More preferably, the ration will be about 3:1 to about 1:3. Still more preferably, the ratio will be about 1:1.

[417] U.S. Patent No. 5,676,954 (which is herein incorporated by reference) reports on the injection of genetic material, complexed with cationic liposomes carriers, into mice. U.S. Patent Nos. 4,897,355, 4,946,787, 5,049,386, 5,459,127, 5,589,466, 5,693,622, 5,580,859, 5,703,055, and international publication no. WO 94/9469 (which are herein incorporated by reference) provide cationic lipids for use in transfecting DNA into cells and mammals. U.S. Patent Nos. 5,589,466, 5,693,622, 5,580,859, 5,703,055, and international publication no. WO 94/9469 provide methods for delivering DNA-cationic lipid complexes to mammals.

[418] In certain embodiments, cells are engineered, *ex vivo* or *in vivo*, using a retroviral particle containing RNA which comprises a sequence encoding a polypeptide of the present invention. Retroviruses from which the retroviral plasmid vectors may be derived include, but are not limited to, Moloney Murine Leukemia Virus, spleen necrosis virus, Rous sarcoma Virus, Harvey Sarcoma Virus, avian leukosis virus, gibbon ape leukemia virus, human immunodeficiency virus, Myeloproliferative Sarcoma Virus, and mammary tumor virus.

[419] The retroviral plasmid vector is employed to transduce packaging cell lines to form producer cell lines. Examples of packaging cells which may be transfected include, but are not limited to, the PE501, PA317, R-2, R-AM, PA12, T19-14X, VT-19-17-H2, RCRE, RCRIP, GP+E-86, GP+envAm12, and DAN cell lines as described in Miller, Human Gene Therapy 1:5-14 (1990), which is incorporated herein by reference in its entirety. The vector may transduce the packaging cells through any means known in the art. Such means include, but are not limited to, electroporation, the use of liposomes, and CaPO₄ precipitation. In one alternative, the retroviral plasmid vector may be encapsulated into a liposome, or coupled to a lipid, and then administered to a host.

[420] The producer cell line generates infectious retroviral vector particles which include polynucleotide encoding a polypeptide of the present invention. Such retroviral vector particles then may be employed, to transduce eukaryotic cells, either *in vitro* or *in vivo*. The transduced eukaryotic cells will express a polypeptide of the present invention.

[421] In certain other embodiments, cells are engineered, *ex vivo* or *in vivo*, with polynucleotide contained in an adenovirus vector. Adenovirus can be manipulated such that it encodes and expresses a polypeptide of the present invention, and at the same time is inactivated in terms of its ability to replicate in a normal lytic viral life cycle. Adenovirus expression is achieved without integration of the viral DNA into the host cell chromosome, thereby alleviating concerns about insertional mutagenesis. Furthermore, adenoviruses have been used as live enteric vaccines for many years with an excellent safety profile (Schwartz et al. Am. Rev. Respir. Dis. 109:233-238 (1974)). Finally, adenovirus mediated gene transfer has been demonstrated in a number of instances including transfer of alpha-1-antitrypsin and CFTR to the lungs of cotton rats (Rosenfeld, M. A. et al. (1991) Science 252:431-434; Rosenfeld et al., (1992) Cell 68:143-155). Furthermore, extensive studies to attempt to establish adenovirus as a causative agent in human cancer were uniformly negative (Green, M. et al. (1979) Proc. Natl. Acad. Sci. USA 76:6606).

[422] Suitable adenoviral vectors useful in the present invention are described, for example, in Kozarsky and Wilson, Curr. Opin. Genet. Devel. 3:499-503 (1993); Rosenfeld et al., Cell 68:143-155 (1992); Engelhardt et al., Human Genet. Ther. 4:759-769 (1993); Yang et al., Nature Genet. 7:362-369 (1994); Wilson et al., Nature 365:691-692 (1993); and U.S. Patent No. 5,652,224, which are herein incorporated by reference. For example, the adenovirus vector Ad2 is useful and can be grown in human 293 cells. These cells contain the E1 region of adenovirus and constitutively express Ela and Elb, which complement the defective adenoviruses by providing the products of the genes deleted from the vector. In addition to Ad2, other varieties of adenovirus (e.g., Ad3, Ad5, and Ad7) are also useful in the present invention.

[423] Preferably, the adenoviruses used in the present invention are replication deficient. Replication deficient adenoviruses require the aid of a helper virus and/or packaging cell line to form infectious particles. The resulting virus is capable of infecting cells and can express a polynucleotide of interest which is operably linked to a promoter, but cannot replicate in most cells. Replication deficient adenoviruses may be deleted in one or more of all or a portion of the following genes: E1a, E1b, E3, E4, E2a, or L1 through L5.

[424] In certain other embodiments, the cells are engineered, *ex vivo* or *in vivo*, using an adeno-associated virus (AAV). AAVs are naturally occurring defective viruses that require helper viruses to produce infectious particles (Muzyczka, N., Curr. Topics in Microbiol. Immunol. 158:97 (1992)). It is also one of the few viruses that may integrate its DNA into non-dividing cells. Vectors containing as little as 300 base pairs of AAV can be packaged and can integrate, but space for exogenous DNA is limited to about 4.5 kb. Methods for producing and using such AAVs are known in the art. See, for example, U.S. Patent Nos. 5,139,941, 5,173,414, 5,354,678, 5,436,146, 5,474,935, 5,478,745, and 5,589,377.

[425] For example, an appropriate AAV vector for use in the present invention will include all the sequences necessary for DNA replication, encapsidation, and host-cell integration. The polynucleotide construct is inserted into the AAV vector using standard cloning methods, such as those found in Sambrook et al., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Press (1989). The recombinant AAV vector is then transfected into packaging cells which are infected with a helper virus, using any standard technique, including lipofection, electroporation, calcium phosphate precipitation, etc. Appropriate helper viruses include adenoviruses, cytomegaloviruses, vaccinia viruses, or herpes viruses. Once the packaging cells are transfected and infected, they will produce infectious AAV viral particles which contain the polynucleotide construct. These viral particles are then used to transduce eukaryotic cells, either *ex vivo* or *in vivo*. The transduced cells will contain the polynucleotide construct integrated into its genome, and will express a polypeptide of the invention.

[426] Another method of gene therapy involves operably associating heterologous control regions and endogenous polynucleotide sequences (e.g. encoding a polypeptide of the present invention) via homologous recombination (see, e.g., U.S. Patent No. 5,641,670, issued June 24, 1997; International Publication No. WO 96/29411, published September 26, 1996; International Publication No. WO 94/12650, published August 4, 1994; Koller et al., Proc. Natl. Acad. Sci. USA 86:8932-8935 (1989); and Zijlstra et al., Nature 342:435-438 (1989), which are herein incorporated by reference. This method involves the activation of a gene which is present in the target cells, but which is not normally expressed in the cells, or is expressed at a lower level than desired.

[427] Polynucleotide constructs are made, using standard techniques known in the art, which contain the promoter with targeting sequences flanking the promoter. Suitable

promoters are described herein. The targeting sequence is sufficiently complementary to an endogenous sequence to permit homologous recombination of the promoter-targeting sequence with the endogenous sequence. The targeting sequence will be sufficiently near the 5' end of the desired endogenous polynucleotide sequence so the promoter will be operably linked to the endogenous sequence upon homologous recombination.

[428] The promoter and the targeting sequences can be amplified using PCR. Preferably, the amplified promoter contains distinct restriction enzyme sites on the 5' and 3' ends. Preferably, the 3' end of the first targeting sequence contains the same restriction enzyme site as the 5' end of the amplified promoter and the 5' end of the second targeting sequence contains the same restriction site as the 3' end of the amplified promoter. The amplified promoter and targeting sequences are digested and ligated together.

[429] The promoter-targeting sequence construct is delivered to the cells, either as naked polynucleotide, or in conjunction with transfection-facilitating agents, such as liposomes, viral sequences, viral particles, whole viruses, lipofection, precipitating agents, etc., described in more detail above. The P promoter-targeting sequence can be delivered by any method, included direct needle injection, intravenous injection, topical administration, catheter infusion, particle accelerators, etc. The methods are described in more detail below.

[430] The promoter-targeting sequence construct is taken up by cells. Homologous recombination between the construct and the endogenous sequence takes place, such that an endogenous sequence is placed under the control of the promoter. The promoter then drives the expression of the endogenous sequence.

[431] The polynucleotide encoding a polypeptide of the present invention may contain a secretory signal sequence that facilitates secretion of the protein. Typically, the signal sequence is positioned in the coding region of the polynucleotide to be expressed towards or at the 5' end of the coding region. The signal sequence may be homologous or heterologous to the polynucleotide of interest and may be homologous or heterologous to the cells to be transfected. Additionally, the signal sequence may be chemically synthesized using methods known in the art.

[432] Any mode of administration of any of the above-described polynucleotides constructs can be used so long as the mode results in the expression of one or more molecules in an amount sufficient to provide a therapeutic effect. This includes direct needle injection, systemic injection, catheter infusion, biolistic injectors, particle

accelerators (i.e., "gene guns"), gelfoam sponge depots, other commercially available depot materials, osmotic pumps (e.g., Alza minipumps), oral or suppository solid (tablet or pill) pharmaceutical formulations, and decanting or topical applications during surgery. For example, direct injection of naked calcium phosphate-precipitated plasmid into rat liver and rat spleen or a protein-coated plasmid into the portal vein has resulted in gene expression of the foreign gene in the rat livers (Kaneda et al., Science 243:375 (1989)).

[433] A preferred method of local administration is by direct injection. Preferably, a recombinant molecule of the present invention complexed with a delivery vehicle is administered by direct injection into or locally within the area of arteries. Administration of a composition locally within the area of arteries refers to injecting the composition centimeters and preferably, millimeters within arteries.

[434] Another method of local administration is to contact a polynucleotide construct of the present invention in or around a surgical wound. For example, a patient can undergo surgery and the polynucleotide construct can be coated on the surface of tissue inside the wound or the construct can be injected into areas of tissue inside the wound.

[435] Therapeutic compositions useful in systemic administration, include recombinant molecules of the present invention complexed to a targeted delivery vehicle of the present invention. Suitable delivery vehicles for use with systemic administration comprise liposomes comprising ligands for targeting the vehicle to a particular site. In specific embodiments, suitable delivery vehicles for use with systemic administration comprise liposomes comprising polypeptides of the invention for targeting the vehicle to a particular site.

[436] Preferred methods of systemic administration, include intravenous injection, aerosol, oral and percutaneous (topical) delivery. Intravenous injections can be performed using methods standard in the art. Aerosol delivery can also be performed using methods standard in the art (see, for example, Stribling et al., Proc. Natl. Acad. Sci. USA 189:11277-11281, 1992, which is incorporated herein by reference). Oral delivery can be performed by complexing a polynucleotide construct of the present invention to a carrier capable of withstanding degradation by digestive enzymes in the gut of an animal. Examples of such carriers, include plastic capsules or tablets, such as those known in the art. Topical delivery can be performed by mixing a polynucleotide construct of the present invention with a lipophilic reagent (e.g., DMSO) that is capable of passing into the skin.

[437] Determining an effective amount of substance to be delivered can depend upon a number of factors including, for example, the chemical structure and biological activity of the substance, the age and weight of the animal, the precise condition requiring treatment and its severity, and the route of administration. The frequency of treatments depends upon a number of factors, such as the amount of polynucleotide constructs administered per dose, as well as the health and history of the subject. The precise amount, number of doses, and timing of doses will be determined by the attending physician or veterinarian.

[438] Therapeutic compositions of the present invention can be administered to any animal, preferably to mammals and birds. Preferred mammals include humans, dogs, cats, mice, rats, rabbits sheep, cattle, horses and pigs, with humans being particularly preferred.

Biological Activities

[439] Polynucleotides or polypeptides, or agonists or antagonists of the present invention, can be used in assays to test for one or more biological activities. If these polynucleotides or polypeptides, or agonists or antagonists of the present invention, do exhibit activity in a particular assay, it is likely that these molecules may be involved in the diseases associated with the biological activity. Thus, the polynucleotides and polypeptides, and agonists or antagonists could be used to diagnose, prognose, prevent and/or treat the associated disease.

[440] Human proteins are believed to be involved in biological activities associated with a variety of biological processes, for example, cellular signaling. Accordingly, compositions of the invention (including polynucleotides, polypeptides and antibodies of the invention, and fragments and variants thereof) may be used in the diagnosis, prognosis, prevention and/or treatment of diseases and/or disorders associated with aberrant activity of human polypeptides.

[441] In preferred embodiments, compositions of the invention (including polynucleotides, polypeptides and antibodies of the invention, and fragments and variants thereof) may be used in the diagnosis, prognosis, prevention and/or treatment of diseases and/or disorders relating to diseases and disorders of the endocrine system, the nervous system (See, for example, "Neurological Disorders" section below), and the immune system (See, for example, "Immune Activity" section below).

[442] In certain embodiments, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to

diagnose and/or prognose diseases and/or disorders associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1a, column 8 (Tissue Distribution Library Code).

[443] Thus, polynucleotides, translation products and antibodies of the invention are useful in the diagnosis, prognosis, prevention and/or treatment of diseases and/or disorders associated with activities that include, but are not limited to, prohormone activation, neurotransmitter activity, cellular signaling, cellular proliferation, cellular differentiation, and cell migration.

[444] More generally, polynucleotides, translation products and antibodies corresponding to this gene may be useful for the diagnosis, prognosis, prevention and/or treatment of diseases and/or disorders associated with the following systems.

Immune Activity

[445] Polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention may be useful in treating, preventing, diagnosing and/or prognosing diseases, disorders, and/or conditions of the immune system, by, for example, activating or inhibiting the proliferation, differentiation, or mobilization (chemotaxis) of immune cells. Immune cells develop through a process called hematopoiesis, producing myeloid (platelets, red blood cells, neutrophils, and macrophages) and lymphoid (B and T lymphocytes) cells from pluripotent stem cells. The etiology of these immune diseases, disorders, and/or conditions may be genetic, somatic, such as cancer and some autoimmune diseases, acquired (e.g., by chemotherapy or toxins), or infectious. Moreover, polynucleotides, polypeptides, antibodies, and/or agonists or antagonists of the present invention can be used as a marker or detector of a particular immune system disease or disorder.

[446] In another embodiment, a polypeptide of the invention, or polynucleotides, antibodies, agonists, or antagonists corresponding to that polypeptide, may be used to treat diseases and disorders of the immune system and/or to inhibit or enhance an immune response generated by cells associated with the tissue(s) in which the polypeptide of the invention is expressed, including one, two, three, four, five, or more tissues disclosed in Table 1A, column 8 (Tissue Distribution Library Code).